This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

Y4. C73/7:S.hrg. 101-665

P6-79

S. HRG. 101-665

MAGNETIC LEVITATION RANSPORTATION ACT OF 1990

HEARING

BEFORE THE

BCOMMITTEE ON SURFACE TRANSPORTATION

OF THE

COMMITTEE ON COMMERCE, CIENCE, AND TRANSPORTATION UNITED STATES SENATE

ONE HUNDRED FIRST CONGRESS

SECOND SESSION

ON

S. 1898

ROVIDE FEDERAL GOVERNMENT GUARANTEES OF INVESTMENTS OF
ATE AND LOCAL GOVERNMENT PENSION FUNDS IN HIGH-SPEED
TERCITY RAIL FACILITIES

S. 2286

EQUIRE THE SECRETARY OF TRANSPORTATION TO LEAD AND CO-
DINATE FEDERAL EFFORTS IN THE DEVELOPMENT OF MAGNETIC
VITATION TRANSPORTATION TECHNOLOGY AND FOSTER IMPLE-
ENTATION OF A MAGNETIC LEVITATION TRANSPORTATION SYSTEM

MARCH 21, 1990

Printed for the use of the
Committee on Commerce, Science, and Transportation

STANFORD UNIVERSITY
JUL 1990
JOHNSON LIBRARY OF GOVT DOCUMENTS

U.S. GOVERNMENT PRINTING OFFICE
785 O
WASHINGTON : 1990

RECORD ONLY:

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ERNEST F. HOLLINGS, South Carolina, *Chairman*

DANIEL K. INOUYE, Hawaii
WENDELL H. FORD, Kentucky
J. JAMES EXON, Nebraska
ALBERT GORE, JR., Tennessee
JOHN D. ROCKEFELLER IV, West Virginia
LLOYD BENTSEN, Texas
JOHN F. KERRY, Massachusetts
JOHN B. BREAUX, Louisiana
RICHARD H. BRYAN, Nevada
CHARLES S. ROBB, Virginia

JOHN C. DANFORTH, Missouri
BOB PACKWOOD, Oregon
LARRY PRESSLER, South Dakota
TED STEVENS, Alaska
ROBERT W. KASTEN, JR., Wisconsin
JOHN McCAIN, Arizona
CONRAD BURNS, Montana
SLADE GORTON, Washington
TRENT LOTT, Mississippi

KEVIN G. CURTIN, *Chief Counsel and Staff Director*
WALTER B. McCORMICK, JR., *Minority Chief Counsel and Staff Director*

SUBCOMMITTEE ON SURFACE TRANSPORTATION

J. JAMES EXON, Nebraska, *Chairman*

JOHN D. ROCKEFELLER IV, West Virginia
ERNEST F. HOLLINGS, South Carolina
DANIEL K. INOUYE, Hawaii
ALBERT GORE, JR., Tennessee
JOHN B. BREAUX, Louisiana
CHARLES S. ROBB, Virginia

ROBERT W. KASTEN, JR., Wisconsin
BOB PACKWOOD, Oregon
LARRY PRESSLER, South Dakota
CONRAD BURNS, Montana
SLADE GORTON, Washington
TRENT LOTT, Mississippi

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ERNEST F. HOLLINGS, South Carolina, *Chairman*

DANIEL K. INOUYE, Hawaii
WENDELL H. FORD, Kentucky
J. JAMES EXON, Nebraska
ALBERT GORE, JR., Tennessee
JOHN D. ROCKEFELLER IV, West Virginia
LLOYD BENTSEN, Texas
JOHN F. KERRY, Massachusetts
JOHN B. BREAUX, Louisiana
RICHARD H. BRYAN, Nevada
CHARLES S. ROBB, Virginia

JOHN C. DANFORTH, Missouri
BOB PACKWOOD, Oregon
LARRY PRESSLER, South Dakota
TED STEVENS, Alaska
ROBERT W. KASTEN, JR., Wisconsin
JOHN MCCAIN, Arizona
CONRAD BURNS, Montana
SLADE GORTON, Washington
TRENT LOTT, Mississippi

KEVIN G. CURTIN, *Chief Counsel and Staff Director*
WALTER B. MCCORMICK, JR., *Minority Chief Counsel and Staff Director*

SUBCOMMITTEE ON SURFACE TRANSPORTATION

J. JAMES EXON, Nebraska, *Chairman*

JOHN D. ROCKEFELLER IV, West Virginia
ERNEST F. HOLLINGS, South Carolina
DANIEL K. INOUYE, Hawaii
ALBERT GORE, JR., Tennessee
JOHN B. BREAUX, Louisiana
CHARLES S. ROBB, Virginia

ROBERT W. KASTEN, JR., Wisconsin
BOB PACKWOOD, Oregon
LARRY PRESSLER, South Dakota
CONRAD BURNS, Montana
SLADE GORTON, Washington
TRENT LOTT, Mississippi

CONTENTS

Page

Opening statement by Senator Exon 1
Opening statement by the Chairman 2
Opening statement by Senator Bryan 21
Text of bills:
  S. 1898 3
  S. 2286 9

LIST OF WITNESSES

Boardman, William J., on behalf of MAGLEV USA 47
  Prepared statement 50
Carmichael, Hon. Gilbert E., Administrator, FRA; accompanied by James T. McQueen, Associate Administrator, Passenger and Freight Services; and Robert L. Krick, Director for Research and Development 22
  Prepared statement 26
Danby, Gordon T., senior physicist, Brookhaven National Laboratory 45
Gran, Richard J., director of advanced concepts, Grumman Corp 92
  Prepared statement 94
Koenig, Ervon R., marketing and business development manager, Bechtel 89
Pattison, Robert, representing the High Speed Rail Assn 68
  Prepared statement 70
  Letter of March 22, 1990 87
Reid, Hon. Harry, U.S. Senator from Nevada 15
Yurek, Gregory J., representing the Council on Superconductivity for American Competiveness 57
  Prepared statement 59

ADDITIONAL ARTICLES, LETTERS, AND STATEMENTS

Capon, Ross, executive director, National Association of Railroad Passengers, letter 109
Casey, Hon. Robert P., Governor, State of Pennsylvania, statement 104
Claytor, W. Graham, president, Amtrak, letter 110
Page, Robert W., Assistant Secretary of the Army, Civil Works, Department of the Army, letter 101
Sweeney, John L., senior vice president, corporate services, CSX Transportation, letter 108

MAGNETICALLY LEVITATED TRANSPORTATION ACT OF 1990

WEDNESDAY, MARCH 21, 1990

U.S. Senate,
Committee on Commerce, Science, and Transportation,
Subcommittee on Surface Transportation,
Washington, DC.

The subcommittee met, pursuant to notice, at 2.32 p.m., in room SR-253, Russell Senate Office Building, Hon. J. James Exon (chairman of the subcommittee) presiding.

Staff members assigned to this hearing: Robert Holleyman, staff counsel; Sheryl Webber Washington, professional staff member; and Gerri Hall, minority professional staff member.

OPENING STATEMENT BY SENATOR EXON

Senator Exon. The subcommittee will please come to order.

This afternoon the Surface Transportation Subcommittee is holding a hearing on two bills related to the development of magnetically levitated transportation, commonly called maglev.

These bills introduced include S. 1898, the maglev Guarantee Pilot Program Act, and S. 2286, the Magnetic Levitation Transportation Act of 1990.

S. 1898 was introduced by Senator Reid, and S. 2286 was authored by Senator Hollings and myself.

As many of you know, United States scientists, one of whom will testify this afternoon, pioneered maglev technology in the 1960s and the 1970s. During this time maglev was only developed to the prototype scale or model stage.

In 1975 U.S. efforts were abandoned, unfortunately in my opinion, when the Federal funding was terminated. Japan and West Germany are now the leaders in the field of maglev technology.

Last October this subcommittee held a hearing on the general subject of advanced transportation systems on both maglev and high-speed rail transportation. Some of the issues covered during these hearings included the technology that is currently available, the plans for implementing these systems in the U.S., the need for Federal or state funding as well as the need for legislation to facilitate development of or eliminate barriers to construction of these systems.

I am happy to report that for the first time since the mid 1970s the executive branch is supporting funding for high-speed rail and maglev systems.

The President's budget for fiscal year 1991 has proposed $6.2 million for the Federal Railroad Administration $3.5 million for the Army Corps of Engineers. I believe the United States Government is recognizing the need to reenter the maglev marketplace. These two bills being discussed today incorporate some of the suggestions made at our earlier hearing and would provide ways to stimulate that development.

S. 1898 would provide $10 billion over five years in loan guarantees of public pension fund investments in the construction of high-speed rail and maglev systems.

S. 2286 would provide $50 million in each of the next two fiscal years to support up to 50 percent of the funding for cooperative maglev research and development agreements with industry.

This bill also seeks to establish an office of high-speed ground transportation within the FRA.

I am interested in hearing the comments and suggestions of the distinguished group of witnesses assembled here today on these and other provisions of the two bills.

I have a statement that Senator Hollings would like to have included in the record.

[The statement and bills follow:]

OPENING STATEMENT BY THE CHAIRMAN

Today this Committee is holding its second hearing this Congress on an issue I find to be of increasing importance—magnetically levitated transportation. If we are to remain competitive as a nation, we need to do a better job at transporting people, and maglev offers that potential. The two pieces of legislation to be addressed today, S. 1898 and S. 2286, are the first steps in what I hope will culminate in a strong maglev system in the United States.

Originally, maglev technology was developed in the United States but lost Federal support in the mid-1970s. As a result of this, we lost the lead in maglev technology to the Germans and Japanese. It is my hope that the United States, through a comprehensive Federal policy, can regain some of the ground we lost in maglev technology. In order to do this we need to develop a genuine partnership between the private and public sectors. This partnership can provide us with the research to develop and utilize maglev in this country. This also will put the U.S. back in the race to develop the next generation of maglev technology and help promote a domestic industry geared towards this advanced technology.

I look forward to the testimony of the witnesses on both of the pending measures, as well as early Committee consideration of maglev legislation.

101st CONGRESS
1st Session

S. 1898

To provide Federal Government guarantees of investments of State and local government pension funds in high-speed intercity rail facilities.

IN THE SENATE OF THE UNITED STATES

November 17 (legislative day, November 6), 1989

Mr. Reid (for himself and Mr. Moynihan) introduced the following bill; which was read twice and referred to the Committee on Commerce, Science, and Transportation

---

A BILL

To provide Federal Government guarantees of investments of State and local government pension funds in high-speed intercity rail facilities.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the "Mag-Lev Guarantee Pilot Program Act".

★(Star Print)

SEC. 2. FEDERAL GOVERNMENT GUARANTEES OF PENSION FUND INVESTMENTS IN HIGH-SPEED INTERCITY RAIL FACILITIES.

(a) In General.—In order to provide access to money sources which otherwise would not be available, the Secretary of Transportation (hereafter in this section referred to as the "Secretary"), is authorized to guarantee the unpaid principal and interest due on any loan made by a State or local government from funds of a pension plan established and maintained for such government's employees to a high-speed intercity rail facility.

(b) Limitation on Guarantee Authority.—The total amount of loan guarantees authorized in subsection (a) shall equal $2,000,000,000 for each of five successive fiscal years beginning after the date of the enactment of this Act. Any unused guarantee authority from any fiscal year shall be carried forward to the next succeeding fiscal year, but in no event shall more than $2,000,000,000 be available in any fiscal year.

(c) Terms and Conditions of Loan Guarantee.—Loan guarantees under this section shall be on such terms and conditions as the Secretary determines, except that a guarantee shall be made under this section only if—

(1) the loan bears interest at a rate not to exceed such annual percent on the outstanding principal obligation as the Secretary determines to be reasonable,

taking into account the range of interest rates prevailing in the private sector for similar loans and risks by the United States,

(2) the terms of the loan require full repayment over a period not to exceed 15 years, and

(3) in the judgment of the Secretary, there is reasonable assurance of repayment of the loan by the borrower.

(d) ADDITIONAL TERMS AND CONDITIONS.—(1) The Secretary may impose a charge for any loan guarantee made under this section.

(2) Any loan guarantee made under this section shall be assignable to the extent provided in the contract of guarantee entered into by the Secretary.

(3) Any guarantee made under this section shall be uncontestable, except in the case of fraud or misrepresentation of which the holder had actual knowledge at the time such holder acquired the loan.

(e) DEFAULT.—In the event of a default of a loan guaranteed hereunder the holder of the guarantee shall immediately notify the Secretary in writing of such default and the Secretary shall thereupon pay to such holder the pro rata portion of the amount guaranteed and shall be subrogated to the rights of the holder of the guarantee and receive an assignment of the obligation and security. The Secretary may cancel the uncollectable portion of any obligation to which the Secretary has an assignment or a subrogated right under this section. Nothing in this subsection shall be construed to preclude any forbearance for the benefit of the borrower as may be agreed upon by the parties to the loan and approved by the Secretary. The Secretary may establish the date, not later than the date of judgment and decree of foreclosure or sale, upon which accrual of interest or charges shall cease.

(f) HIGH-SPEED RAIL DEVELOPMENT FUND.—(1) There is established in the Treasury of the United States a High-Speed Rail Loan Guarantee Fund (hereafter in this subsection referred to as the "Fund"), which shall be available to the Secretary for carrying out the loan guarantee program authorized by this section, including the payment of administrative expenses incurred in connection therewith. Amounts in the Fund not needed for current operations may, with the approval of the Secretary of the Treasury, be invested in bonds or other obligations of, or guaranteed by, the United States.

(2) There is authorized to be appropriated into the Fund such sums as are necessary (taking into account such fees as may be imposed under subsection (d)(1) and transferred into the Fund) to carry out the purposes described in paragraph (1). The amounts in the Fund shall remain available until expended, except that after the expiration of the period de-

scribed in subsection (b)(2) such amounts in the Fund as are not required to secure outstanding guarantee obligations shall be paid into the general fund of the Treasury.

(g) PLEDGE OF FULL FAITH AND CREDIT OF UNITED STATES.—The full faith and credit of the United States is pledged to the payment of all obligations incurred under this section.

(h) HIGH-SPEED INTERCITY RAIL FACILITY.—(1) For purposes of this section, the term "high-speed intercity rail facility" means any facility (including rolling stock) for the fixed guideway rail transportation of passengers and their baggage between metropolitan statistical areas (within the meaning of section 143(k)(2)(B) of the Internal Revenue Code of 1986) using vehicles that are reasonably expected to operate at speeds in excess of 150 miles per hour between scheduled stops, but only if such facility will be made available to members of the general public as passengers.

(2) For purposes of paragraph (1), the rolling stock of a high-speed intercity rail facility shall consist of only such unmanufactured articles, materials, and supplies as have been mined or produced in the United States, and only such manufactured articles, materials, and supplies as have been manufactured in the United States.

(i) GAO STUDY.—The Comptroller General of the United States, within two years after the date of the enactment of this Act, shall analyze the effectiveness of the loan guarantee program established by this section and report the results of such analysis to appropriate committees of the Congress.

II

101st CONGRESS
2d Session

S. 2286

To require the Secretary of Transportation to lead and coordinate Federal efforts in the development of magnetic levitation transportation technology and foster implementation of a magnetic levitation transportation system.

IN THE SENATE OF THE UNITED STATES

March 9 (legislative day, January 23), 1990

Mr. Hollings (for himself and Mr. Exon) introduced the following bill; which was read twice and referred to the Committee on Commerce, Science, and Transportation

---

A BILL

To require the Secretary of Transportation to lead and coordinate Federal efforts in the development of magnetic levitation transportation technology and foster implementation of a magnetic levitation transportation system.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SHORT TITLE

Section 1. This Act may be cited as the "Magnetic Levitation Transportation Act of 1990".

FINDINGS

Sec. 2. The Congress finds the following:

(1) An efficient, integrated transportation network is an essential element in assuring the economic progress of the United States.

(2) Our Nation's current transportation network faces increasing demands and limited capacity. The Federal interstate highway system is nearing completion and it has been over two decades since the construction of a major new airport in the United States.

(3) Conventional ground and air transportation systems rely heavily on fossil fuels, which are in limited supply.

(4) Magnetic levitation (maglev) is an energy efficient, high-speed transportation technology with the potential to supplement existing transportation modes, increase system capacity, and support economic growth.

(5) While maglev technology was pioneered in the United States, development since 1975 has been concentrated outside of this country.

(6) Cooperative research and development efforts among industry, the academic community, and government are necessary for the United States to regain a leadership role in the next generation of maglev and for maglev to become a reality in the United States. Federal efforts should be directed toward support or a

domestic maglev industry and construction of viable maglev systems as part of an integrated transportation network.

(7) The Department of Transportation has been charged historically with promoting advanced transportation systems through the High-Speed Ground Transportation Act and has responsibility for the safety of maglev and newly emerging technologies pursuant to the Rail Safety Improvement Act of 1988.

(8) In order for maglev to achieve its potential within the United States, existing Federal efforts need to be strengthened, with the Department of Transportation leading these efforts in cooperation with the other interested agencies.

RESEARCH AND DEVELOPMENT

SEC. 3. The first section of the High-Speed Ground Transportation Act (79 Stat. 893) is amended by designating the existing text as subsection (a) and by adding at the end the following new subsection:

"(b) Pursuant to the authority under subsection (a) to undertake research and development in high-speed ground transportation, the Secretary, in consultation with the Secretaries of Commerce, Energy, and Defense, the Administrator of the Environmental Protection Agency, and the heads of other interested agencies, shall lead and coordinate Federal efforts in the development of magnetic levitation (maglev) transportation technologies and foster its implementation as an alternative transportation system.".

COOPERATIVE AGREEMENTS WITH UNITED STATES COMPANIES

SEC. 4. The High-Speed Ground Transportation Act (79 Stat. 893) is amended by inserting immediately after section 3 the following new section:

"SEC. 4. (a) In carrying out the responsibilities of the Secretary under the first section, the Secretary of Transportation is authorized to enter into one or more cooperative research and development agreements (as defined by section 12 of the Stevenson-Wydler Technology Innovation Act of 1980, 15 U.S.C. 3710a) with United States companies for the purpose of—

"(1) conducting research to overcome technical and other barriers to the development and construction of practical magnetic levitation transportation systems and to help create the basic generic technologies needed for these systems; and

"(2) transferring that research and basic generic technologies to industry in order to help create a viable commercial magnetic levitation transportation industry within the United States.

"(b) In an agreement under subsection (a), the Secretary may agree to provide not more than 50 per centum of the cost of any project under the agreement. Not less than 5 per centum of the non-Federal entity's share of the cost of any such project shall be paid in cash.

"(c) The research, development, or utilization of any technology pursuant to an agreement under subsection (a), including the terms under which such technology may be licensed and the resulting royalties may be distributed, shall be subject to the provisions of the Stevenson-Wydler Technology Innovation Act of 1980 (15 U.S.C. 3701 et seq.).

"(d) At the conclusion of fiscal year 1991 and again at the conclusion of fiscal year 1992 the Secretary shall submit reports to Congress regarding research and technology transfer activities conducted pursuant to the authorization contained in subsection (a).".

AUTHORIZATION OF APPROPRIATIONS

SEC. 5. Section 11 of the High-Speed Ground Transportation Act (79 Stat. 895) is amended to read as follows:

"SEC. 11. There are authorized to be appropriated to the Secretary $50,000,000 for fiscal year 1991 and $50,000,000 for fiscal year 1992, to carry out the provisions of this Act relating to magnetic levitation transportation.".

HIGH-SPEED GROUND TRANSPORTATION OFFICE

SEC. 6. Section 103 of title 49, United States Code, is amended by adding at the end the following new subsection:

"(e) There is established within the Administration the High-Speed Ground Transportation Office, which shall be headed by a Director, who shall report to the Administrator. It shall be the function of the Office to—

"(1) establish national uniform standards for high-speed rail and magnetically levitated superconducting transportation system technology;

"(2) regulate the design and construction of regional high-speed transportation systems to ensure that they conform to national standards on technology, safety, and environmental quality; and

"(3) on an annual basis make recommendations for such legislative or administrative action as may be necessary to facilitate such projects.".

DEFINITION

SEC. 7. For purposes of this Act, the term "High-Speed Ground Transportation Act" means the Act entitled "An Act to authorize the Secretary of Commerce to undertake research and development in high-speed ground transportation, and for other purposes", approved September 30, 1965 (Public Law 89–220; 79 Stat. 893).

○

Our first witness, my colleague from Nevada, Senator Harry Reid, has been one of the leaders in the Senate on this technology, and his efforts are well underway with regard to some development in maglev in his state.

We will also hear from FRA administrator Gil Carmichael, who had made the development of high-speed transportation systems one of the priorities of his administration, and to you, Gil Carmichael, I thank and salute you and I appreciate the close working relationship that we have had in this area.

We will also hear from panels of leaders in this field. The first includes Dr. Gorton Danby of Brookhaven National Laboratory and one of the inventors of the maglev technology; Dr. Gregory Yurek, representing the Council of Superconductivity; Mr. William Boardman, representing the MAGLEV USA; and Mr. Robert Pattison, representing the High Speed Rail Association.

The members of the second panel are Dr. Richard Gran of the Grumman Corporation and Mr. Ervon Koenig of Bechtel.

I appreciate all of you expert witnesses being here today, and first I will be glad to recognize my great friend and colleague from the state of Nevada, the senior Senator, Senator Reid.

STATEMENT OF HON. HARRY REID, U.S. SENATOR FROM NEVADA

Senator REID. Mr. Chairman, you are very kind. Thank you very much for holding this hearing on S. 1898, the bill that I have drafted, and S. 2286.

The series of hearings you have held over the past several years prove your outstanding commitment to high-speed rail and maglev transportation. I hope, Mr. Chairman, that this hearing will be followed in the near future by a mark-up of both my bill and S. 2286.

Mr. Chairman, my message to you today is very simple. The Maglev Guaranteed Pilot Program Act must be enactod soon in order to jump start America's stalled maglev effort.

I believe that time is short. Germany and Japan have marketable systems right now. They are even advertising the programs. Over the next decade they will invest billions of dollars to become worldwide leaders in this new technology.

In contrast our government is planning a tiny fraction, a puny $10 million in fiscal year 1991. I am grateful for that, but we have to recognize in comparison it is hardly enough to get in the race much less to compete in the race.

S. 1898 provides the necessary financial jump start to get private industry involved, and it does it within the severe budget constraints faced by the Federal Government.

The Federal Government in the past was not shy about providing this type of jump start for other forms of transportation infrastructure.

Mr. Chairman, one of my favorite columnists if not my favorite is George Will, and he noted in his column last week that Abraham Lincoln entered politics by campaigning for a spot in the Illinois Assembly. What was his number one issue? It was not slavery, it was not secession. It was public funding for infrastructure.

And I would like to make this column of George Will part of the record for this year.[1]

Senator Exon. Without objection, it is so ordered.

Senator Reid. The Federal Government has funded canal construction, highway construction and airport construction. The Federal Government granted the railroads one third of all the land west of the Mississippi as an incentive to build an intercontinental railroad. They would not have been built without the carrot being strung out there by the Federal Government.

But my favorite example, Mr. Chairman, of the Federal Government's involvement is a very simple one. In 1844 a man came to Congress and convinced the Congress and the President that he had a great idea. He said, in fact, that it would revolutionize the communications industry.

The Federal Government in 1844 provided $40,000 to build a line—a telegraph line it was called—between Washington, D.C. and Baltimore, Maryland, to see if this would work. It worked.

After this telegraph line was put up, the Federal Government stepped out of the picture. For an investment of $40,000 the communications industry not only of the United States, but the world was radically altered to the better.

The Federal Government has been involved in the past and, as you know, this example that I have used the telegraph has evolved into a multi, multi billion dollar industry.

It is interesting to note, Mr. Chairman, that there is a plaque near the old Supreme Court chamber on the House side of the Capitol commemorating the transmittal of the first message on that telegraph line.

So I invite you, Mr. Chairman, and the other members of this subcommittee to understand that the Federal Government has in the past been involved in getting the private sector interested in good programs.

All of the examples above and the maglev have one thing in common. They are private sector inventions which the private sector cannot develop into a national network without some kind of Federal involvement to minimize the risk factor.

My legislation, I believe, is the very kind of involvement we need. The bill guarantees investment of public pension funds into construction of maglev facilities estimated to be from 80 to 90 percent of maglev's costs and thereby minimizes the risk for investors. And the risk, Mr. Chairman, is real.

Several economic analyses of maglev have been done. They show that travelers will get off of airplanes and onto other forms of transportation if the cost is two thirds that of air travel. 29 percent more people would travel from California, for example, to Las Vegas if there were a cheaper way to get there. Analyses also show return on investment is not likely for eight to 12 years.

The States of California and Nevada and the State of Florida are heavily involved in looking at this maglev transportation system. I have heard said on a number of occasions that the State of Florida, if it continues at its present rate of growth that by the year 2000 will need 44 lanes of freeway up and down the state.

---

[1] See Washington Post, March 13, 1990.

Well, it is not going to happen, but the state is continuing to grow and we have to figure out some way to move these people.

And, finally, all these studies show that the true costs are, at the present time, unknown. The risk, therefore, I repeat is real, and industry knows this.

But, Mr. Chairman, the benefits far outweigh the risks. Maglev is ideally suited to provide high-speed travel on routes from 100 to 400 miles in length. It provides numerous other benefits as well as in areas such as: traffic congestion and air traffic congestion; the environment; energy independence; job creation; balance of trade; and competitiveness.

I would like to address each of these very briefly. First of all, traffic congestion. Highway travel delays in urban areas now total more than two billion hours annually. Use of maglev will help relieve this.

Air traffic congestion. Domestic enplanements will increase 62.5 percent by the year 2000. Mr. Chairman, a week ago I went to Reno, Nevada. I left here at 5.00 in the afternoon, arrived in Reno 15 hours later. Why? Because I flew into Dallas, landed on the airfield and waited three and a half hours to get a gate. Weather? There was not a cloud in the sky. I do not know what the problem was, but we waited in that airplane for three and a half hours.

We were told that they had 35 gates for 120-some odd airplanes. Well, air traffic congestion is not a figment of our imagination. To those of us that travel the country—and those of us in the Senate do that—it is a real serious problem. 15 hours to go from Washington, D.C., to Reno, Nevada.

By the year 2000, 50 airports we are told will be not congested but severely congested. I do not know the distinction, but it sounds ominous to me.

A maglev route from Washington, D.C. to New York could free as many as 120 landing slots.

The environment. Maglev creates no pollution other than that generated by the electric power plant producing the power of the train. At a time when we are debating the Clean Air bill on the Senate floor, it makes sense to develop a new technology that is good for the environment and good for the economy.

Energy independence. U.S. reliance on imported oil is growing as we speak here today. The electricity from maglev can be produced by fuels available here in this country.

Job creation. Many U.S. companies would be involved in building maglev trains and the routes for maglev. Thousands, thousands of new, high-paying jobs would be created.

Balance of trade. A domestic maglev system would be in demand worldwide. Sales of these systems overseas would have a positive impact on our trade deficit.

Mr. Chairman, I know how you have been involved in this committee trying to do something about the inadequate balance of trade we have. Well, I am here to remind everyone on this subcommittee that it is only going to be made worse if we do not do something.

Magnetic levitation is here. You are going to have Mr. Danby, Professor Danby, one of the inventors of this system, come and you might ask him why they decided to invent it, which is an interesting story in itself. But the invention is here. It is going to happen.

Japan and Germany have already made it happen, and unless we get our industry involved, we are going to be involved with Magnetic levitation transportation, but we are going to be buying all the equipment from someplace else.

And that deals with my next subject which is competitiveness. U.S. companies are likely to focus their efforts on construction of a so-called second generation maglev system. Such a system could utilize high temperature, superconductivity and drive research efforts in this area. The potential spin-off benefits of such a breakthrough are also revolutionary.

This is not a panacea for every problem that exists. However, it will contribute to the solution. Many U.S. companies are poised to get heavily involved in this industry. These companies include some of those represented here today like Grumman, Bechtel and the American Superconductor Corporation.

Others include Boeing, Lockheed, McDonnell Douglas, Ford and GM. Private industry is waiting for a signal to get involved. If this legislation becomes law, the message and the incentive would be loud and clear. If the Federal Government believes in maglev and we stand behind it, then the companies I listed above and many others, big and small, will jump in with R&D, managerial, marketing and other business skills to create the number one maglev industry and nation in the world. That means millions of dollars of their own money invested in a new technology, a technology worth billions that will revolutionize transportation in this country and greatly improve our quality of life.

Mr. Chairman, I again want to express to you my appreciation for you holding this hearing and just say in passing because I do have to leave and I am not going to have the pleasure of listening to Gilbert Carmichael's testimony, but I do want to say—and I do not want this to sound as negative as perhaps it will be taken—but way back in November of last year when this bill was introduced we asked for comments from the Federal Railroad Administration, comments about this legislation. We still have not heard them.

I have had the opportunity to briefly review the FRA's testimony here today, and I think it is too bad that we have not had the benefit of this testimony at an earlier time.

And I would also say, Mr. Chairman, that I think it is time that we as a nation, we as a legislative branch of government and a federal branch of government stop being so negative and tell all of the bad things that are—all the bad things that can be whipped up about a piece of legislation.

We need to be positive. Otherwise we are going to be running around saying why did we not do something about this type of industry if it is going to sweep the world? And so I appreciate again your allowing me to take this time. I think you and your staff have put together an outstanding list of witnesses that certainly will give this committee a bird's eye view of the importance of this industry.

Senator **Exon**. Thank you very much. I cannot tell you how much we appreciate your efforts and one of the bills we are considering today is leadership that we generally expect of you and we appreciate that.

Let me just ask you one question. There may be some other questions for the record, but we have two panels today, and if you can, I would like to have you stay and listen to FRA Administrator Carmichael. But we are all very busy these days, and maybe that is not possible.

I worked very closely with FRA Administrator Carmichael on this, and this is the first administration that I have worked with that gave any consideration at all that this is something we should look at. Certainly you gave some very interesting statistics that I think should help spur along the interest in this technology and what it can do for America in the future. And I would agree that as we look forward direct to the transportation in the 21st century, it is not going to be just jet aircraft. We are going to have to do something more.

That is one of the reasons that I have been an eternal fighter for continuation of the rail service that we have in this country, passenger service through Amtrak, because if that ever dies, we are going to have a tough time starting it up again. And it would seem to me that if and when we ever build extensive maglev or high-speed rail systems in America, they should tie in to whatever existing systems we have now, which is Amtrak. Because we obviously are not instantaneously going to have what we need in this area.

What do you think, though, of Mr. Carmichael's testimony that will be given which, as near as I can tell, negates one of the most important benefits of the private sector participation, which was extensive Federal loan guarantees. I am somewhat concerned and I am wondering if that concerns you.

I do not how we are going to get moving on this somewhere along the line, unless the government is going to put in some cash money up front. Or at a minimum, loan guarantees if we are going to get of a dime. What do you think about that, Senator?

Senator **Reid**. Mr. Chairman, we now have approximately $750 billion in public pension funds. We have about $2.3 trillion in other types of pension funds. The legislation that I have written, have suggested to the Committee, says that these moneys should be made available for research and development of high-speed trains. And what I say is, it is a net win for everyone.

It certainly would not sacrifice the pension funds because the Federal Government would guarantee that. But yet with the budget deficits that we are running, we would not have to come up with money, taxpayers' money, so to speak. We feel confident that with the experiences that we have had with the savings and loan fiasco that the programs could be set up so that the pension funds would be protected and the American taxpayer would be protected.

And the benefit is significant. I do not want to keep harping on the telegraph, but there are many other programs that the Federal Government has been involved in, and rightfully so in the past, that have gotten industries off the ground. And we have here today some of these very companies. These are multi-million if not billion dollar companies themselves, most of them. But yet they are not willing to take the chance unless the Federal Government shows some commitment.

Now I am certain that you will get from these companies today, these companies will say, in effect, we are willing to get involved, but only if the Federal Government is going to show us that they are committed also to the program. And I think that with the deficits that we have, with the money that is available in these programs, it is a net win for everyone.

Senator **Exon**. Senator, what led you to the option of having some of the state pension funds used and backed and guaranteed by the Federal Government? What brought you to that conclusion? And you are aware that I guess some the managers of those state pension plans are not enthusiastic about the suggestion that money be lent in that fashion.

They may be as concerned as some of the rest of us are that Uncle Sam is so far in debt and that it is now using its Social Security funds. If I were the manager of a state pension fund I would say, wait a minute. These people are already more obligated than they can ever get out of to the primary Social Security system. Were you thinking that we would give some priority of revenues from this maglev proposition to maybe give them some assurances?

Senator **Reid**. Mr. Chairman, my answer to that is very simple. If in fact there is a manager of a portfolio like you that was not willing to lend them money, then they would not be involved in the program. All this does is open the door.

I am convinced that the manager of the multi-billion dollar program that Nevada has would be happy to do business with Bechtel, Lockheed, Boeing, some of the major companies in the United States. If these people came to the Nevada pension program—what is the name of it, Senator Bryan? What is the Nevada program called, where the state money is sent? Public Employees Retirement System. If they came there, I am sure that that system would be happy to do business with one of these companies. But if they did not, then they could go to Nebraska and try to convince your people.

There is nothing that would be twisting any arms. This would be an arm's length business transaction that has made America great. No one would be forced to do anything. It would just make it permissible in nature.

Senator **Exon**. Thank you, Senator.

Senator Lott.

Senator **Lott**. Mr. Chairman, I thank you. I just want to be brief and commend the distinguished senator from Nevada for his leadership in this area. It is obvious you have given a lot of thought to it, something we need to look at as a country. But I have to confess, the next witness, Gil Carmichael, is a Mississippian, so I am anxious to get to him. Thank you, Harry.

Senator **Reid**. I wondered what was wrong with Gil.

Senator **Exon**. Senator Bryan.

OPENING STATEMENT BY SENATOR BRYAN

Senator **Bryan**. Mr. Chairman, I too will be brief. I would like to commend my senior colleague and Senator Hollings for their leadership on this issue and express my full support for him.

Mr. Chairman. I commend you for holding this hearing on maglev transportation.

I am proud that Nevada is in the forefront of the development of this new technology, which promises to have a significant impact on our nation's transportation policy.

Our nation is facing a transportation crisis, which is slowly deteriorating our industrial and economic base. Airports are too crowded, and highways are too congested. The cost in lost time and fuel of highway delays will quadruple by the year 2005, to 46.5 billion dollars a year. In addition, traffic Congestion aggravates the pollution suffocating our cities, and forces us to look overseas to fill our insatiable need for oil.

There are limits to the amount of traffic our highways can carry, or our airways can accommodate. Alternative transportation systems must be developed.

The California-Nevada Super Speed Train Commission is well on its way to opening a high speed train between Las Vegas and Anaheim. The train will provide a boost to Las Vegas' already booming tourist industry. It will relieve the traffic congestion which has traditionally accompanied the growth of metropolitan areas. Finally, the train will replace at least 33 million vehicle-miles of automobile travel, reducing energy needs in the corridor by 17 percent.

Unfortunately, the Commission has been forced to look overseas for the technology it needs. whether it chooses high speed rail or maglev, the Commission cannot buy american.

If the Commission decides to use maglev technology, the implications will be especially hard to bear. Americans invented maglev, were crucial to its initial develoment, but will stand by and watch their overseas competitors build the world's first large scale maglev system right in their own backyard.

It is too late for American high speed trains to run between Las Vegas and Anaheim; this route needs to be built now, and should be operational before the end of the decade. It is not too late for Americans to catch up in the high speed train technology race. When I look around the world to the current leaders in high speed trains, France, West Germany, and Japan, I notice one overriding similarity: a sustained interest and commitment on the part of their national governments to the development of new technology. America can be competitive, but will not if we stand idly by while the rest of the world sells an originally American invention back to America.

I commend Senator Reid and Senator Hollings for introducing legislation to allow us to catch up in the race to develop maglev.

Senator **Exon**. Senator Gorton, we are ready to go to Mr. Carmichael. Do you have any questions?

Senator **Gorton**. No.

Senator **Exon**. Thank you. Thank you, Senator. You are excused.

And we are very pleased now to call to the witness table, Hon. Gilbert Carmichael, the Administrator of the Federal Railroad Administration.

Gilbert, will you please come forward? Welcome. Glad to have you back before the Committee once again.

And we are talking about something today that you and I and others have discussed and been in hearings before and discussed privately, and we are delighted that you are here to help us out. So without further ado, we will accept the full statement that you have provided for the record, and I will ask you to proceed in any fashion that you care to at this time.

STATEMENT OF HON. GILBERT E. CARMICHAEL, ADMINISTRATOR, FEDERAL RAILROAD ADMINISTRATION, ACCOMPANIED BY JAMES T. McQUEEN, ASSOCIATE ADMINISTRATOR, PASSENGER AND FREIGHT SERVICES; AND ROBERT L. KRICK, DIRECTOR FOR RESEARCH AND DEVELOPMENT

Mr. CARMICHAEL. Mr. Chairman, it is a pleasure to be back here and to be talking on this subject. I do have a short summary of my presentation. So if you would bear with me, I would like to introduce my cohorts here. Jim McQueen, on my left, is the Associate Administrator for Passenger and Freight. And the boss in the maglev research area.

Senator EXON. Welcome, Jim.

Mr. CARMICHAEL. Bob Krick, on my right side, is the Deputy in Jim's department and the Research Director—Bob Krick.

Senator EXON. Welcome to you, Bob.

Mr. CARMICHAEL. Distinguished members of the Committee we are very happy to be here to testify on behalf of the Department of Transportation on one of the most exciting developments in transportation in recent years, magnetic levitated high speed ground transportation or maglev, as it is called.

Congestion on our highways, as Senator Reid pointed out, and at our airports is constraining inter-city mobility to the point that economic growth could very easily be affected, adversely affected. Maglev is a very safe system. Operating at speeds in excess of 300 miles per hour, it offers the potential to dramatically improve surface transportation mobility using a technology that is energy efficient and very ethically and environmentally sound.

At this time last week, in fact last Thursday, Secretary Skinner and myself, were in Emsland, West Germany, and we rode the maglev. We glided along in comfort at over 200 miles per hour in the 07 model, the prototype Transrapid.

We even had a fly by. We stood about 25 meters on the side of it as it went by us at 200-odd miles per hour. With a decibel meter, the sound level is extremely low. It only registered 78 on the decibel meter. If you stand in front of that decibel meter, clap your hands, that will do 100 decibels. That tells you that a 200-mile-an-hour maglev going across the country is very environmentally quiet or silent.

I have met with the designers of this system and the system under development in Japan. I have met with the state and local officials and private developers who want to put their own money in to bring maglev into the United States. I have come away from those meetings with the belief that maglev has the potential to play a major role in the Nation's transportation system beginning in this decade, not the next century.

At the direction of Congress' Appropriation Committees, FRA is studying the feasibility of a commercial maglev in the United States. This is going to be kind of a quick-and-dirty study, but it will be completed and ready and delivered to you in June of this year, 1990. It will provide an initial insight into maglev's market potential, the economic and technical feasibility of commercial maglev systems and legislative and other institutional changes that would facilitate the development of a U.S. designed and manufactured maglev system.

This study is still in progress. It is clear that both of the current maglev systems are still in the formative stage with some bugs to be worked out, more in the Japanese system than there are in the German system. When I was over there last week, I met with one of the Bechtel Corporation's people who was studying the system also. He said that they could not find any bugs in the system at that time, and that they thought it was ready for production.

One of the other questions is the rather substantial capital costs. There is an awful lot of questioning and discussion about the capital costs of building maglev. I have heard figures as low as $7 million a mile to construct it, and as high as $40 million a mile to construct it. Our study will help answer some of that discrepancy and that wide range.

This is a natural stage, I suppose, for any new technology, and it offers us an opportunity to improve on the existing technology and develop the second generation of maglev in this country that will become the system of choice in the 21st century. Some of the proponents and opponents of maglev call the German system the first-type system, the Japanese the second-type system, and in the United States we may be looking at a third generation system.

As you are no doubt aware, the President's budget request for fiscal 1991 includes a request for approximately $10 million to explore the possibility of stepped-up U.S. efforts in maglev. Building on the previous R&D and results of the current feasibility study, that program is designed to determine the appropriate role for maglev in the United States transportation system, the economic feasibility, the appropriate safety and operating standards and the remaining technologies that must be developed to achieve an efficient, economically sound and environmentally acceptable U.S. system.

The goal of the program is to facilitate private development of an operational maglev system in the United States based on domestically designed and manufactured technology. To avoid possible duplication of efforts, Federal agencies with an interest in maglev are working to coordinate their efforts.

Last year, at the end of the year, I organized the Federal maglev Executive Policy Committee, which I have the privilege to chair and which includes Major General Pat Kelly of the Corps of Engineers, who serves as the co-chairman with me on this executive committee.

I also have on the committee Dr. Tom Larson of FHWA, Brian Clymer of UMTA, Jim Busey of FAA and representatives of the Department of Energy and the EPA who all form this executive policy board. The Committee will set policy and ensure that Federal magnetic levitation activities are coordinated. The process is working well.

I believe the combining of the Department's expertise in transportation and in maglev technology with the expertise in the other areas of the other Federal agencies, will lead to a very thorough analysis and useful recommendations for the future of maglev in the United States.

The recommendations will be completed in this in-depth study in early 1992 and will lay out the potential for maglev and the steps by the government and the private sector necessary to realize this potential. The questions that people are asking and the frustration they are expressing, we hope we will have answered in about a 12- to 15-month time frame.

In your letter inviting me to testify, you asked for my views on two pieces of legislation pending before this subcommittee. S. 1898, the Maglev Guarantee Pilot Act, and S. 2286, the Magnetic Levitation Act of 1990.

S. 1898 would create a program under which the Secretary would guarantee the unpaid principal and interest of loans for high-speed inter city rail facilities, including maglev, from pension funds of state and local governments. The intent of the bill is to encourage the development of high-speed ground transportation systems. I too want to encourage the development of these systems where they are appropriate. But unfortunately, I have concerns with this bill.

The National Transportation Policy unveiled by President Bush earlier this month encourages consideration of high-speed rail and maglev systems as alternatives to expensive expansion of airports and highways. The Senator was right when he said Florida might have to have 40 lanes of paved highway if they do not do something different.

There is widespread agreement among the parties involved in these projects that private investment will be the central element in building the systems. And I have found ample evidence of private investment and private interest, but a role for the Federal Government is essential in implementing these technologies in the United States. The National Transportation Policy recognizes the need for the Federal Government to provide leadership in research and development, to advance these technologies for deployment in the U.S. and to act as a catalyst to address regulatory and institutional barriers to the implementation of these systems.

My concerns with S. 1898 are threefold: first, I am not convinced that guaranteeing loans from state and local pension funds is an appropriate role for the Federal Government to play.

Second, the Federal guarantees, which could total $10 billion, would cause a large increase in the Federal Government's contingent liabilities at a time where we are struggling to reduce this Federal liability.

My third concern is that extensive Federal guarantees would negate one of the most important benefits of private sector participation—the ability to successfully assess profit potential and balance it against the risk and other uncertainties. In my opinion, the states, localities and the private sector will build high-speed ground transportation of proven technologies in areas where an adequate basis for such service exists.

S. 2286, you also asked for our views on that bill. The Magnetic Levitation Transportation Act of 1990, S. 2286, directs the Department of Transportation, in cooperation with other Federal agencies and the private sector, to undertake a program of research and development leading to the deployment of advanced maglev systems in the United States. One of the important issues of the National Transportation Policy is a program of research and development in support of maglev and other promising technologies for improving our Nation's transportation system.

As I mentioned earlier, FRA, in cooperation with other Federal agencies, has restarted its maglev R&D efforts. And we have jump-started them and they are moving. The bill authorizes appropriations to the Department of Transportation for $50 million in 1991 and $50 million in 1992 for maglev related activities. The level for fiscal year 1991 varies significantly from the President's budget request. I would recommend that any authorization be consistent with our budget request or that the authorization use the term "such sums as may be necessary."

The funding levels contained in the President's budget represent a considered plan for Federal support for maglev development in the United States. I cannot help but compare the funding level as very similar to the $40,000 that Senator Reid was talking about. We hope that $10 million plays that same sort of role.

I just came from a hearing of FRA's budget before a House Appropriations Subcommittee. I testified there that the $6.15 million in the President's fiscal year 1991 budget for FRA, together with the $3.5 million funding proposed for the Corps of Engineers, would be adequate to begin the Federal maglev initiative and to move toward a point in early 1992 where we can make recommendations about the future of maglev and the Federal Government's role in its development.

The United States has a long history of scientific and technological breakthroughs that have permitted advances in transportation worldwide. The department's transportation policy statement, which was announced earlier this month by President Bush and Secretary Skinner, builds on that expertise and supports a federal initiative to assess the possibility of such a breakthrough with maglev.

The Federal Government will serve as a catalyst in the process by supporting research and development of technical issues and working to ensure that regulatory and institutional barriers do not impede implementation of cost-effective, environmentally sound transportation systems like maglev.

I personally say that I want FRA and its role in the Department of Transportation to be innovative and stimulative. I do not want us to hold this back in any way. I want our safety regulations ready when the system is ready to operate.

Maglev systems offer an infrastructure alternative that is less disruptive, and probably less expensive than the construction of new highways or airports. These maglev systems can wear the

Made in the U.S.A. label, if we all, the Federal and State governments and the private sector, pool our efforts toward that commo goal.

Mr. Chairman, this concludes my statement. I and my staff wil be happy to answer any questions that the subcommittee ma have.

[The statement follows:]

TESTIMONY OF GILBERT E CARMICHAEL

FEDERAL RAILROAD ADMINISTRATOR

Mr. Chairman, distinguished members of the Committee, it is my privilege to appear before this Subcommittee to testify on behalf of the Department of Transportation on one of the most exciting developments in transportation in recent years -- magnetically levitated high speed ground transportation or Maglev.

Congestion on our highways and at our airports is constraining intercity mobility to the point that economic growth may soon be adversely affected. Maglev, with very safe operating speeds in excess of 300 mph, offers the potential to dramatically improve surface transportation mobility using a technology that is energy-efficient and environmentally sound.

At this time last week, Secretary Skinner and I were in Emsland, West Germany, gliding along in comfort at over 200 miles per hour in the prototype Transrapid maglev. I have met with the designers of this system and of the system under development in Japan. And I have met with State and local officials and private developers who want to put up their own money to bring maglev to the United States. I have come away from those meetings with the belief that maglev has the potential to play a major role in this Nation's transportation system beginning in this decade and extending well into the next century.

Initial maglev systems would likely develop on a regional basis with distances up to 600 miles, absorbing excess highway and airline demand. High speed maglev systems, connecting regional airports as well as city centers, could provide an attractive alternative to short distance airline travel and could prove effective in relieving airport congestion. Regional maglev systems could ultimately expand to form a nationwide system.

There are basically two types of maglev systems being tested today. One works on the magnetic attraction principle where the vehicle underframe, which wraps around the guideway, is drawn up to within three-eights of an inch of the bottom surface of the guideway. The German Transrapid system, now nearing the end of its prototype testing, is an example of the attraction technology. The other, the Japanese Railways' prototype, works on the magnetic repulsion principle, pushing the vehicle 4-6 inches above the guideway. As you know, much of the original research into maglev was conducted by the Federal Railroad Administration. During the FRA's period of active maglev research and development (R&D), Germany, Japan and other countries involved in maglev research shared the products of our efforts. We can see the embodiment of much of America's and DOT's own R&D developments in both the German and Japanese prototypes.

Although both the German and Japanese systems are in the full scale prototype testing stage, no high speed maglev system is presently in revenue service. The Germans have approved construction of a revenue service line to connect the Bonn/Cologne and Dusseldorf airports, a distance of approximately 50 miles. The Japanese, however, have decided to undertake further prototype testing and are considering the construction of a prototype test track in the suburbs of Tokyo.

Both the Germans and Japanese have made impressive advances in developing this technology, but I believe that there is a potential for a U.S. designed, advanced maglev system that could become the system of choice for future high speed ground transportation systems. The task before us now is to determine the appropriate role of the Federal Government in this development.

I will begin my testimony by describing the Department's role in maglev development, what we have done, what we are doing, and what we believe should be done in the future. I will then address the specific questions contained in your letter inviting me to testify here today.

PAST DOT EFFORTS IN THE DEVELOPMENT OF MAGLEV

The Department's earliest involvement with maglev dates from the High Speed Ground Transportation Act of 1965. Under that Act, we funded a wide range of research into all forms of high speed ground transportation. The Department rapidly became a world leader in maglev research and along with the National Science Foundation sponsored research which produced scale model demonstrations of the maglev concept. Research by the Department lead to the development of the linear motor, the motive power used by all current maglev prototypes. In 1974, a prototype linear induction motor research vehicle set a world speed record of 255.4 m.p.h. at the Department's Test Center in Pueblo, Colorado.

In recent years, the Department has funded feasibility studies by States considering high speed ground transportation systems and has been the catalyst for many efforts to define the potential for such systems, providing both seed money and technical assistance. Prominent among these are advanced projects proposed for Florida, Texas, Ohio, California/Nevada and Pennsylvania.

Finally, enactment of the Rail Safety Improvement Act of 1988 [45 U.S.C. 431(a)] specifically made the Federal Railroad Administration (FRA) responsible for establishing and enforcing maglev safety standards. We have restarted our maglev research, including a major initiative to provide a basis for maglev safety standards.

THE CURRENT STATUS OF MAGLEV IN THE U.S.

A number of States have investigated the feasibility of high speed maglev systems, and some have concluded that private maglev systems are feasible. The Florida High Speed Rail Transportation Commission is in the second phase in its process for awarding a franchise to build and operate a maglev line between Orlando Airport and the nearby theme park area, approximately 14 miles away. This line, which could begin construction as early as next year, would employ the German technology and be financed by Japanese banks. Public and private interests in Pittsburgh recently announced plans for a detailed feasibility study of a 27 mile link between the city's downtown and its airport using Transrapid Maglev and for developing maglev manufacturing activity in the Pittsburgh area. The Transrapid Maglev is likely to be a serious contender as the high speed ground transportation system to connect Las Vegas with the Los Angeles region.

CURRENT DOT MAGLEV-RELATED ACTIVITIES

As the agency responsible for the safety of maglev systems, the Department has initiated a major research and testing effort to ensure the safety of U.S. maglev systems. Research on the Transrapid system, the system proposed for the Florida project, is underway and is being accelerated to ensure that unresolved concerns with safety do not slow implementation. This work will evaluate the adequacy of the existing German safety standards covering this maglev system, the compliance of the system with these standards, and the need for additional standards for operation in the U.S.

FRA's initial safety research focuses on Transrapid and attractive maglev technology because it has been formally proposed for implementation in the U.S., but we also intend to cover repulsive levitation technology as represented by the Japanese design. Our first priority in these efforts is safety, and we are working with the developers of the systems to ensure that FRA safety standards and regulations are clear and timely so that they may be considered in future system design. We want safety built into the systems, not added later.

The Department is also assisting the Florida officials and developers in exploring the environmental issues related to the proposed Florida Maglev project, and will serve as the lead agency for preparation of any Federally required environmental documentation.

The Department is exploring the use of existing transportation rights-of-way, such as the Interstate Highway System and freight rail lines. Preliminary assessments by the Federal Highway Administration have indicated that the location of maglev systems in Interstate Highway median strips may be technically feasible in certain corridors where not otherwise constrained by horizontal curvature limitations. We are continuing to explore this issue and will work with interested parties to develop mechanisms to expedite the requisite approvals where highway segments can be used in a project.

At the direction of the Congress' Appropriations Committees, FRA is studying the feasibility of commercial maglev in the U.S. That study will be completed in June 1990, and will provide an initial insight into maglev's market potential, the economic and technical feasibility of commercial maglev systems, and legislative and other institutional changes that would facilitate the development of U.S. designed and manufactured maglev systems. Although the study is still in progress, it is clear that both current maglev systems are still in the formative stage with some bugs to be worked out, including the rather substantial capital costs. This is a natural stage for any new technology, and it offers us the opportunity to improve on the existing technology and develop the second generation of maglev in this country that would become the system of choice in the 21st century.

FUTURE DOT MAGLEV ACTIVITIES

As you are no doubt aware, the President's budget request for Fiscal Year 1991 includes a request for approximately $10 million to explore the possibility of stepped-up U.S. efforts in maglev, $6.15 million to the FRA and $3.5 million to the Corps of Engineers. Building on previous R&D and results of the current feasibility study, that program is designed to determine the appropriate role for maglev in the U.S. transportation system, the economic feasibility, the appropriate safety and operating standards, and the remaining technologies that must be developed to achieve an efficient, economically sound and environmentally acceptable U.S. system. The goal of the program is to facilitate private development of an operational maglev system in the U.S. based on a domestically designed and manufactured technology.

To avoid possible duplication of efforts, Federal agencies with interests in maglev have established a mechanism to coordinate their efforts. The Federal Maglev Executive Committee which I have the privilege to chair, includes Major General Pat Kelly of the Corps of Engineers who serves as co-chairman, Jeffery Shane, Assistant Secretary for Policy and International Affairs of the Department of Transportation, Tom Larson, the Federal Highway Administrator and J. Michael Davis, Assistant Secretary for

Conservation and Renewable Energy of the Department of Energy. I have also extended an invitation to Administrator Reilly of the Environmental Protection Agency and Admiral Busey, the Federal Aviation Administrator, to be represented. The Committee will set policy for our coordinated maglev efforts, which we are calling the Federal Maglev Initiative. At the working level, the Federal Maglev Coordinating Committee is directing implementation of the programs and coordinating all Federal maglev efforts. In addition to the agencies represented on the Executive Committee, EPA, NASA and the Department of Commerce are participating in these efforts so that we can take advantage of their specialized expertise. We also expect to get input from the Surgeon General when we begin to address health related issues.

The process is working well. I believe the combining of the Department's expertise in transportation and in maglev technology with the expertise in other areas of the other Federal agencies will lead to thorough analysis and useful recommendations on the future of maglev in the U.S. The recommendations, to be completed in early 1992, will lay out the potential for maglev and the steps by the government and the private sector necessary to realize this potential.

VIEWS ON BILLS PENDING BEFORE THE SUBCOMMITTEE

In your letter inviting me to testify, you asked for my views on two pieces of legislation pending before this Subcommittee, S.1898 - The Mag-Lev Guarantee Pilot Program Act, and S.2286 - The Magnetic Levitation Act of 1990.

S.1898

S.1898 would create a program under which the Secretary would guarantee the unpaid principal and interest of loans to high speed intercity rail facilities, including maglev, from pension funds of State and local government workers. The intent of the bill is to encourage the development of high speed ground transportation systems. I too want to encourage the development of these systems, where they are appropriate, but unfortunately I have concerns with this bill.

The National Transportation Policy, unveiled by President Bush earlier this month, encourages consideration of high speed rail and maglev systems as alternatives to expensive expansion of airports and highways. There is widespread agreement among the parties involved in these projects that private investment will be the central element in building the systems, but that a role for the Federal Government is essential in implementing these technologies in the United Sates. The Policy recognizes the need for the Federal Government to provide leadership in research and development to advance the technologies for deployment in the U.S. and to act as a catalyst to address regulatory and institutional barriers for the implementation of these systems. S.1898 would establish the Federal government, through its program of Federal guarantees of loans from pension plans to high speed rail systems, the as the primary player in guarenteeing funding of construction of these systems.

My concerns with S.1898 are threefold: First, I am not convinced that guaranteeing loans from state and local pension funds is an appropriate role for the Federal government to play. Second, the Federal guarantees, which could total $10 billion, would a cause large increase in the Federal government's contingent liability at a time when we are struggling to reduce this Federal liability. My third concern is that extensive Federal guarantees would negate one of the most important benefits of private sector participation, the ability to successfully assess profit potential and balance it against risks and other uncertainties.

In my opinion, the States, localities and the private sector will build high speed ground transportation systems of proven technologies in areas where an adequate basis for such a service exists. Florida offers an excellent example. The State recognized the need for a high speed ground system connecting three of its major urban areas--Tampa, Orlando and Miami and developed a mechanism for its financing under which a private sector developer of this system would receive certain real estate development rights that would enable the developer to capture some of the increase in real estate values resulting from the rail system. FRA's role in this project is to coordinate the requirements of the Federal agencies and to assist the State and its private partner in dealing with them. This mechanism appears to be working. The Florida High Speed Rail Corporation proposes to build a $2.45 billion system funded totally in the private sector. They do not even plan to take advantage of Federal tax free industrial revenue bonds that would be available to help fund this project.

Your letter specifically asked for comments on that provision of S.1898 that would require rolling stock to be manufactured in the United States before it could qualify for the investment guarantees. This "buy American" provision is quite restrictive. The Bush Administration supports free trade and is working to create a "level playing field" for international business free of such things as government incentives or subsidies that are designed to restrict imports. I, too, decry the lack of American builders of rail passenger equipment. But people should buy American products because they are the best, not because of some provision of law. American industry can produce the maglev system of choice worldwide if we set that as our goal and follow through.

S.2286

You also asked my views on S.2286 - The Magnetic Levitation Transportation Act of 1990. S.2286 directs the Department of Transportation, in cooperation with other Federal agencies and the private sector, to undertake a program of research and development leading to the deployment of advanced maglev systems in the United States.

One of the important initiatives of the National Transportation Policy that was recently announced by President Bush and secretary Skinner is a program of research and development in support of maglev and other promising technologies for improving our nation's transportation systems. As I stated FRA, in cooperation with other Federal agencies, has begun an effort in this area.

The bill authorizes appropriations to the Department of $50 million in 1991 and $50 million in 1992 for maglev related activities. The level for Fiscal Year 1991 varies significantly from the President's budget request. I would recommend that any authorizations be consistent with our budget request or be stated "such sums as may be necessary." The budget levels represent a considered plan for Federal support for maglev development in the United States.

I just came from a hearing on FRA's budget before a House Appropriations Subcommittee. I testified there that the $6.15 million in the President's fiscal year 1991 budget for FRA together with the $3.5 million of funding proposed for the Corps of Engineers, would be adequate to begin the Federal Maglev Initiative and to move toward a point in early 1992 where we can make recommendations about the future of maglev and the Federal government's role in its development.

I also have a few minor suggestions for changes to S.2286 which I feel are necessary to give us the tools we need to accomplish our task, and to clarify provisions which might be the source of some confusion. A key one that I will comment on today involves Section 6 which states that it shall be a function of FRA to establish national uniform standards for high speed rail and magnetically levitated superconducting transportation systems. There is the potential for confusion with this provision. It is not yet clear to me that there ultimately will be a need for Federal standards for these systems, other than in the area of safety, but I do agree that FRA is the appropriate agency to set such standards if they are needed. My other concern with this section is that it specifies standards for superconducting maglev which is just one of the two radically different maglev systems in the prototype stage today, and there are several other less developed concepts. As an example, the system I rode last week, which is one that may be built in Florida next year, does not use superconducting magnets. I believe that the bill should make it clear that the Department has the authority to issue such standards as it may deem appropriate, and that the authority to set standards for maglev should be broad enough to cover any potential maglev technology.

The United States has a long history of scientific and technological breakthroughs that have permitted advances in transportation worldwide. The Department's Transportation Policy Statement, which was announced earlier this month by President Bush and Secretary Skinner, builds on that expertise and supports a Federal initiative to assess the possibility of such a breakthrough with maglev. The Federal Government will serve as a catalyst in the process by supporting research and development of technical issues and working to ensure that regulatory and institutional barriers do not impede implementation of cost-effective, environmentally sound transportation options like maglev.

Maglev systems offer an infrastructure alternative that is less disruptive, and possibly less expensive, than the construction of new highways or airports. These maglev systems can wear the "Made in the USA" label if we all, Federal and State Governments and the private sector, pool our efforts toward that common goal.

Mr. Chairman, this concludes my statement and I will be happy to answer any questions that the Subcommittee might have.

Senator EXON. Mr. Administrator, thank you very much.

We have a vote on and will stand in recess subject to the call of the Chair, which should be in about seven minutes.

[Brief recess.]

Senator EXON. The subcommittee will please come back to order.

Senator Gorton, you have been waiting. I got lost in the swamp temporarily. I will be glad to yield to you for questioning now.

Senator GORTON. Thank you. I cannot be here much longer, and I have just two questions.

It seemed to me, Mr. Carmichael, that you danced a little bit around the proposition as to whether or not there ought to be a high-speed ground transportation office in FRA. You spoke to authorizations and staying within the budget and the like, but is this an important enough field that we should make room for it within the Federal Railroad Administration and have an office which concentrates on this subject?

Mr. CARMICHAEL. When I got here last year, Senator, one of the first things I asked for was the definition of a railroad, and in the Safety Act of 1988 you had the definition in there. FRA had the authority over maglev in it.

So I assumed that maglev was there and that was our responsibility. We can give it a specific title if you like, but we have assumed the authority of being responsible under the Safety Act of 1988 and the definition of maglev development for working the safety and technology in concert.

Senator GORTON. So you do not feel inhibited by not having a high-speed ground transportation office as a formally authorized division of FRA?

Mr. CARMICHAEL. At this stage in doing this quick assessment that we have to do, no, sir, I am not inhibited at this point.

Senator GORTON. Okay.

The other question I have is more generally a philosophical one. If I understand where we are going in this connection, having not been able to read all of this testimony, there is a West German technology which is pretty far advanced for which there are major attempts to begin American usages.

There is a Japanese technology which is a competing one which is fairly far advanced and each of which have involved very heavy expenditure in research and development.

You and others are now encouraging and some of the others are asking for rather substantial subsidies, direct and indirect, for a third and competing American technology on this.

I guess my question in a time of constrained circumstances is that if we have two fairly well perfected existing technologies, are we in the long run not better off allowing those two to compete in the United States without subsidy? Will competition mean that one or both of them is going to offer a pretty good deal in which they will eat an awful lot of those research and development costs? Are we as Americans likely to get a better system quicker and less expensively if we allow and encourage that competition and keep large Federal Government subsidies out of the equation?

Mr. CARMICHAEL. I have to answer it in two ways. I feel like the people in American Government and the Federal Railroad Administration are fathers to a big part of the technology that exists in

Germany and in Japan. We were one of the world leaders in the technology back in the 1960s and the 1970s. So I do not say that the German technology or the Japanese technology is theirs. It is ours in that sense.

This new technology is bursting on us. That is how technologies like this do, just like the telegraph burst on us in this thing. It is very important in this 12- to 15-month period that the American government, the American people, American industry, American inventors, and American universities, look quickly to see if we have a superior technology or ideas or inventions that are better than the German prototype that is ready for production or the Japanese model that is in prototype but not ready for production.

I think probably the wisest money we can spend in the world of competition, in being globally competitive, is to find out real fast if there is an American system out here that is superior to those.

The answer again, though, is that if we find that and we also know that, say, the German technology is good technology, I think it would be smart that we control our next generation of magnetic levitation which will be the American system of choice and that we also control the development of the German technology if we can or the Japanese technology.

In the world of global competition we should go after both of them. That is a very small amount of money that we are talking about in making this assessment.

Senator GORTON. Then you think the amount of money you have now is sufficient to answer these questions, and that when the questions are answered the market will produce this kind of transportation system without further subsidies either for construction or operation?

Mr. CARMICHAEL. Senator, at every high-speed rail meeting and high-speed transportation meeting that I have been to there have been bankers there looking for business. I saw them finance the Eurotunnel in the private market, private sector.

When you start moving people at 180 miles an hour and 300 miles an hour on surface transportation to intersect with the city centers and these big airports and their expansions, you make money, and that is why the bankers are there. I think the money is there. We are in the development phase of this new technology. We are almost past the research phase of it, and the role of the government right now is to stimulate that development and to make sure that if we have something better, we had better get it out real quick and get on it.

So the $6 million at this point for FRA is good, coupled with the $3.5 million for the Corps of Engineers. Yes sir, we can make a good, intelligent decision at this point on both of these approaches. FRA's approach was to do both of them. The Corps of Engineers was primarily aimed at developing the American technology. FRA wants to control both of them.

Senator GORTON. Thank you, Mr. Chairman.

Senator EXON. Thank you, Senator Gorton.

Thank you for your excellent comments and suggestions, Administrator Carmichael. Let me ask you a few questions here, and then I will undoubtedly have some for the record so we can move along.

The administration has requested maglev funding for both FRA and the Corps of Engineers. What do you see as the FRA strengths in this area?

Mr. Carmichael. I kind of feel that we are the granddaddy of this technology. We have been involved in it for an awful long time. Sitting beside me are two men that have quite a bit of years of experience in FRA's research and development. The linear motor they tell me that is being used in these systems we have helped to bring about and broke the world speed record at the time, 250 plus miles an hour.

FRA has a very small but a very effective research and development department. We have a tremendous library of data on maglev.

We have hired Dr. John Harding, who was "Mr. Maglev" back in the 1960s and 1970s. He is a physicist, a very bright, very brilliant man. We have hired him, and he is reporting to work on our staff shortly.

Senator Exon. What has been the effort of the Corps of Engineers in this area today?

Mr. Carmichael. General Kelly and I have had a very, very good working relationship. When the OMB in the President's budget put money in both of our budgets, General Kelly and I got together and formed the working group right off the bat. We have an intergovernmental agency working group to make sure we are not duplicating and overlapping and that we are in concert with each other. I also realized with General Kelly's approval that we needed an executive board, and with General Kelly as my co-chairman I asked Jim Busey, Federal Aviation, Dr. Larson, Federal Highway, Administrator Brian Clymer, the UMTA Administrator, and the DOE people to form it. The EPA is also included in it because environmental solutions can help speed the process or slow it down. So EPA is definitely in there. So we have a very high level executive board for policy to help stimulate this technology.

We ran into a problem right off the bat at the Orlando Airport. The airport manager does not know whether he wants maglev or not because it may have something to do with his rental car business, and so that is why we need this interagency organization. The executive board has been formed to address this.

Working with the Corps of Engineers has been very good. General Kelly is a good partner.

Senator Exon. I am trying to understand what the direction is going to be. I assume that you wanted the EPA in there because you assumed that when we start establishing rights-of-way you are going to have to have the Environmental Protection Agency in there, and you are going to have to have some environmental studies, of course. Right?

Mr. Carmichael. Yes, sir.

Senator Exon. I see why they are there.

The Corps of Engineers I presume are primarily there because not only of their expertise in engineering but also their understanding of our roads in the United States and going over land, I suppose.

Is that why you wanted to tap their expertise primarily, or are they going to be developers?

Mr. Carmichael. Well, it is according to whether we go to a prototype process with several hundred million dollars and we develop the prototype or we use the process we are on right now to find and stimulate the private sector.

The Corps of Engineers has a wealth of resources in their construction people. One of the important things about maglev is the guideway that these trains run on, and that guideway is about 65 to 75 percent or maybe more of the cost of a maglev system. So in the area of the construction and the design and the adoption of the standard guideway with which we will have to live with once we drop the standards, and the widths and everything else, the Corps should make a great contribution.

Senator Exon. Is at least one of the possibilities or one of the concepts that such a maglev system would be designed to run adjacent to existing interstate highways' right-of-way?

Mr. Carmichael. Number one, when you are moving at this high speed you need awful straight rights-of-way, and some of the highways and railroad beds do not have real straight guideways. A lot of the maglev will probably be across new country for high speed and direct routes.

There is quite a bit of area, I expect, in the United States, particularly when you get into urban centers, where you are going to need to use an existing right-of-way if you can find it, railroad or highway. Dr. Larson at Federal Highways has told me that the individual states and the Federal Highway Administration have no objection to leasing rights-of-way to private developers or investors for this technology.

Senator Exon. Let me go a little bit further, and then I will ask you some other questions for the record.

Do you have any further views regarding the public/private partnership proposed in S. 2286 for cooperative research purposes? You did address that to some extent in your remarks. Is there anything else that you would care to say for the record?

I have not had a chance to read your testimony which was accepted. If you dealt with it in that, then I would not ask the question. Do you think you handled that in your written statement?

Mr. Carmichael. To the best of our ability at this point.

Senator Exon. Okay. Then the last question I have is do you feel that in the absence of Federal loan guarantees as proposed in S. 1898 that we are likely to see any significant level of maglev development in this country?

Mr. Carmichael. Without the loan guarantees? I think we are going to get it, period.

I know the group that is working on the Orlando project. Their financing is coming from several sources. I was told the other day that Bechtel Corporation had joined with this Orlando group. They are a major construction company in the United States.

Senator Exon. So you are saying that you are not viewing loan guarantees as absolutely vital and critical at least in a large amount?

Mr. Carmichael. No, sir.

Senator Exon. You are looking to the private sector?

Mr. CARMICHAEL. I think the money is there, and I think the systems, the speeds that they are talking about will cash flow very well and that the financing is there.

Senator EXON. Thank you very much, Mr. Administrator. We appreciate your testimony, and I apologize for your having to have been interrupted with that vote. You are excused.

Mr. CARMICHAEL. Thank you very much, sir.

Senator EXON. Our first panel today is Dr. Gordon T. Danby, Dr. Gregory J. Yurek, Mr. William J. Boardman, and Mr. Robert Pattison, and I would appreciate these individuals coming up now. While they are taking their seats, I will explain that Dr. Gordon T. Danby is a senior physicist at the Brookhaven National Laboratory.

Dr. Gregory J. Yurek is president and chief executive officer of American Superconductor Company.

Mr. William J. Boardman is president of Concord Associates.

Mr. Robert Pattison is director, Parsons, Brinckerhoff, Quade and Douglas.

Gentlemen, thank you very much for coming here. Thank you for your patience. We will get right to the testimony. I suggest that we start with you, Dr. Danby.

STATEMENT OF GORDON T. DANBY, SENIOR PHYSICIST, BROOKHAVEN NATIONAL LABORATORY, UPTON, NY

Dr. DANBY. Thank you, Mr. Chairman, for this opportunity to comment on the legislation. My partner, Jim Powell, and I are very supportive but with some concerns.

First, I would like to address the foreign challenge. Japan has commenced the first stage of a 300 mile per hour principal corridor superconducting maglev from Tokyo to Osaka. They could have built parallel to the route of their famed 25-year old bullet high-speed rail near the shoreline. Instead, they chose a much more expensive mountainous route to open up their country. 60 percent of the 300-mile route will be in tunnels. They work very slowly and deeply, and they do not sell things until they are really ready. I know them well.

They are applying more advanced concepts than those used successfully in the first generation at Miyazaki. Since 1978 there they have had thousands of guest passengers, set world speed records, done successful experiments like simulating earth movements of the large clearance guideway.

They have now recently started yet a separate system, a 30-mile airport to Sapporo system. This will be operational in 1994. This will be the world's first commercial superconducting maglev, finished several years before the much larger scale Tokyo-Osaka route.

We have dealt with the Japanese railway for 20 years. We admire the quality of their work, determination and their long-term commitment, and we are, of course, personally gratified that after all this work they have chosen to this day to develop concepts that we invented long ago.

In Germany a test track demonstration system also has carried thousands of guest passengers and is also ready for commercial exploitation. It is an alternate approach to maglev which was believed to have a shorter term development. We and many others do not believe this approach has the potential of the superconducting system. Nevertheless, we wish them well. The German firms have plans for export to the U.S.

We believe the Japanese will prevail for two reasons. It is technically superior; and secondly, it has the very strong backing of the Japanese government and the Japanese people.

Transport needs are very different in the U.S. with our dispersed population and industry. We should build third generation systems appropriate to our needs, economic and flexible in utilization and integrated with our existing highway dominated population and building patterns. We can leapfrog to the forefront if we start now on a five-year construction program.

We have long advocated systems that are capable of moving heavy containerized freight at high speeds in addition to passengers. We alone have done this, and it greatly enhances the viability of maglev.

We both have extensive experience with large scientific projects. I personally have been involved in the design of "big science" devices where my concepts have been responsible for hundreds of millions in expenditures for electromagnetic devices. Our maglev work has always been private and on our own initiative, starting when we first shared a house in 1960. We have worked on maglev in our spare time ever since. At the request of Senator Moynihan and with the approval of the Brookhaven management, we agreed to coordinate the maglev study for the Environment and Public Works Committee. Today I represent myself and my partner.

We support S. 1898, the intent of which is to help stimulate private and local investment in soundly based high-speed transport. The wise choice is, of course, the hard part, but that is not our domain to discuss today.

The request for domestic content should be widened to include guideway structures in that bill.

We would, of course, prefer the title Maglev Guarantee Pilot Program Act to High Speed Intercity Rail. There are only very few locations in the U.S. where high-speed rail might be successful. Some maglev has much greater potential for widespread use. Its capability for single vehicle operation, light and low cost track structures, very high-speed passenger and freight, and the absence of the severe roadbed maintenance problems associated with rail all make it extremely attractive.

We are pleased with the momentum for maglev reflected in S. 2286. $50 million per year for the next two years plus matching private funds is a very positive step. We interpret this as a serious ongoing effort to build actual systems, implying continuation beyond two years.

Our concern is that the money involved is large for study and R&D only, but the time frame is too short to build a system. There are no technical barriers to building maglev. The basic generic technologies now exist in U.S. industry. It only requires third generation design and the leadership to pull it together.

The rapidly accelerating rate of commitment in Japan precludes prolonged studies. An ongoing $50 million per year can catch the attention of the private sector. We urge that the bulk of your funding go to support construction efforts by private U.S. enterprises who undertake entirely at their own risk the high tech R&D they deem required. This will focus the development and minimize the tendency to produce mountains of paper which has very little to do with problemsolving.

Many people want to get into maglev. That is very good, but let them learn on the job on actual construction projects. We want the Boeings of maglev to be in the U.S. for obvious reasons. We will do everything we can to facilitate and participate in building a major third generation system if the opportunity arises.

Thank you for your efforts, and Jim Powell and I thank you for this opportunity.

Senator Exon. Thank you, Dr. Danby. Your statement and all of the other statements that have been submitted are accepted for the record at this time if you would only summarize them.

We are now very pleased to recognize you, Mr. Boardman, to make any presentation you would like.

STATEMENT OF WILLIAM J. BOARDMAN, PRESIDENT, CONCORD ASSOCIATES, ON BEHALF OF MAGLEV USA

Mr. Boardman. Mr. Chairman, I am pleased and honored to be here today to testify on behalf of MAGLEV USA on the provisions of S. 1898 and S. 2286.

MAGLEV USA is a newly formed corporation organized for the purpose of demonstrating the interest of U.S. industry in pursuing the development of a second generation maglev technology that meets U.S. transportation requirements.

Among the members of MAGLEV USA are companies such as General Electric, Westinghouse, Grumman, CSX, Rust International and Sverdrup which have the technological, operational and engineering capabilities to develop a uniquely American maglev system. With this objective in mind and with the support and encouragement of the Abell Foundation of Baltimore and the University of Maryland, MAGLEV USA has begun to explore the feasibility of developing a maglev link to operate between Washington, D.C. and Baltimore as the first leg of a system which would eventually connect Washington to New York City.

The members of MAGLEV USA are most encouraged by the apparent change in Federal transportation policy relative to maglev. While the fiscal year 1991 budget only recommends an additional Federal outlay of $9.7 million for maglev development, it serves as a signal to industry that the Federal Government may be rethinking the potential role of maglev in the context of a U.S. transportation system for the 21st Century.

With the West German and Japanese governments having already expended over $1 billion each on the development of their respective maglev technologies, it would be naive to assume that U.S. industry can leapfrog foreign technology without a more substantial future financial commitment from the Federal Government. In this context, MAGLEV USA is very pleased to comment on the two bills before us today.

As recognized in S. 2286, cooperative research and development efforts are necessary for the United States to regain a leadership role in the next generation of maglev and for maglev to become a reality in the United States. MAGLEV USA is in complete agreement with this finding and believes that the level of funding authorized is an appropriate downpayment on the $750 million or more which will be necessary over the next six or seven years for developing, testing and demonstrating several prototypes of alternative maglev technologies to meet U.S. requirements.

In response to this type of Federal commitment, we believe that U.S. industry will be prepared to come forward to participate on a cost-sharing basis in cooperative research and development programs.

Before addressing the Office of High Speed Ground Transportation that would be created under S. 2286, let me say a few words about the concept of Federal loan guarantees and pension fund investments in city rail facilities.

While some form of Federal guarantee program will surely be necessary to attract private capital investment to the first commercial U.S. maglev projects, the loan guarantee program created under S. 1898 is probably somewhat premature given the current state of maglev technology development in the United States.

Cooperative R&D programs will lead to the development of U.S. maglev technology which will in turn benefit at the commercialization stage from loan guarantees and other financial incentives.

For now, the Federal Government should focus its efforts on serving as the financial catalyst for the development of U.S. technology and on ensuring that regulatory and institutional barriers do not impede implementation of viable maglev systems.

Recognizing that the Federal Government must serve as a catalyst for maglev development, we are left with a question as to the organizational structure that should be established at the Federal level to facilitate maglev development. At present, a working group composed of representatives from DOT, DOD and DOE is attempting to develop a Federal program for maglev development. However, management by committee is not an efficient way to run an extremely complex technology development program.

S. 2286 would establish a high-speed ground transportation office within the Federal Railroad Administration to coordinate the development and implementation of maglev in the United States. Due to the extensive involvement of agencies other than DOT in maglev development, we would like to suggest the establishment of a joint program office of maglev development that would cut across agency jurisdictional lines and would manage the entire U.S. maglev development effort.

The best example of this approach may be the Joint Program Office established for the development of the National Aerospace Plane involving NASA, the Air Force and the Navy. Like maglev, the Aerospace Plane involves R&D for a high tech project and the participation of an industry consortium.

In our view, a joint program office established to coordinate a government/private sector effort is the most expedient and efficient approach to leapfrog foreign technology and achieve an advanced U.S. maglev system.

The joint office should have authority to award contracts and to hire or contract for necessary technical expertise and should coordinate its efforts with each of the participating or interested Federal agencies. As required, existing agencies could detail personnel to the joint program office on long-term assignments.

In closing, let me say that MAGLEV USA is encouraged and excited by the renewed Federal interest in maglev transportation.

Mr. Chairman, that concludes my testimony.

[The statement follows:]

STATEMENT OF WILLIAM J. BOARDMAN, ON BEHALF OF MAGLEV USA

Mr. Chairman and Members of the Subcommittee, I am pleased and honored to be here today to testify on behalf of MAGLEV USA on the provisions of two bills, S.1898 and S.2286, related to the development of maglev systems in the United States.

MAGLEV USA is a newly formed corporation organized for the purpose of demonstrating the interest of U.S. industry in pursuing the development of a second generation maglev technology that meets U.S. transportation requirements. Among the members of MAGLEV USA are companies, such as General Electric, Westinghouse, Grumman, CSX, Rust International, and Sverdrup, which have the technological, operational, and engineering capabilities to develop a uniquely American maglev system. With this objective in mind and with the support and encouragement of the Abell Foundation (a member of MAGLEV USA) of Baltimore and the University of Maryland, MAGLEV USA has begun to explore the feasibility of developing a U.S. maglev technology, with a specific focus on the construction of a maglev system to operate between Washington, D.C. and Baltimore, Maryland. We envision the Washington to Baltimore link as the first leg of a system which would connect Washington to New York City.

At a hearing on March 9 of the Subcommittee on Water Resources, Transportation and Infrastructure of the Senate Committee on Environment and Public Works, Senator Reid reminded everyone that America's dominance in telecommunications began very humbly in the last century when Congress appropriated $40,000 for the construction of the nation's first telegraph line between

Washington and Baltimore. At the time, telegraph was an untested technology. It took the demonstration of a Federal commitment to the development and implementation of a telegraph system before private companies were prepared to commit their considerable resources. The federal government demonstrated its commitment and U.S. industry responded with the development of ever more sophisticated telecommunications technologies.

The same could be true for the development of maglev transportation systems for the U.S. At the same hearing on March 9, Senator Graham wanted to know why no American company had offered to build a maglev line in Florida. He inquired, "if America has the technology, where is it and why hasn't anyone come forward?" Senator Graham asks a very good question.

I believe that the answer to his question has its roots in the unfortunate decision of the federal government to abandon its pioneering program to develop maglev technology. The U.S. program was terminated because rail systems were experiencing financial difficulties and because the advent of larger aircraft had temporarily reduced air congestion. The decision to terminate the U.S. R & D effort sent a signal to participating companies like Ford and Boeing and to the rest of U.S. industry that maglev would have no role in federal transportation planning. Industry develops products to serve a specific market. By terminating its role in maglev development, the federal government signaled to American industry that there would be no market for maglev in the U.S.

With the past as prologue, let me say that the members of

MAGLEV USA are most encouraged by the apparent change in federal transportation policy relative to maglev. In the FY91 federal budget and in the National Transportation Policy released earlier this month, the Administration has signaled that it is rethinking the potential role of maglev in the context of a U.S. transportation system to meet this country's needs for the 21st century. While the FY91 budget only recommended an initial federal outlay of $9.7 million for maglev development, it serves as a signal to industry that the federal government may be committed to the creation of a maglev market in the U.S. after all.

With the West German and Japanese governments having already expended over a billion dollars each on the development of their respective maglev technologies, it would be naive to assume that U.S. industry can "leap frog" foreign technology without a more substantial future financial commitment from the federal government. In this context, MAGLEV USA is very pleased to comment on the two bills, S.2286 and S.1898, before us today.

As stated in SECTION 2 ("FINDINGS") of S.2286, "cooperative research and development efforts among industry, the academic community, and government are necessary for the United States to regain a leadership role in the next generation of maglev and for maglev to become a reality in the United States." MAGLEV USA is in complete agreement with this finding and believes that the level of funding authorized for such purpose - $50 million in each of the next two fiscal years - is appropriate. In response to this type of federal commitment, we believe that U.S. industry will be prepared to come forward, as required by S.2286, to participate on a cost-sharing basis in cooperative research and development programs. U.S. industry is the world leader in areas such as superconductivity, lightweight composite materials, computerized control systems and innovative construction techniques. These strengths should enable the U.S. to produce a second-generation maglev design that offers significant improvements over existing foreign technologies.

Looking beyond FY92, MAGLEV USA agrees with the findings of the Maglev Technology Advisory Committee in its report to the Senate Committee on Environment and Public Works that federal funding in the amount of at least $750 million will be necessary over the next six to seven years for developing, testing, and demonstrating several prototypes of alternative maglev technologies that meet U.S. requirements. We hope that this Committee views the $100 million authorized by S.2286 as a down payment on much broader cooperative efforts to develop a second generation maglev system.

Before addressing the proposed establishment of an Office of High-Speed Ground Transportation within the Department of Transportation that would be created under S.2286, let me say a few words about the concept of federal loan guarantees of pension fund investments in high-speed intercity rail facilities. While some form of federal guarantee program will surely be necessary to attract private capital investment to the first commercial U.S. maglev projects, the loan guarantee program created under S.1898 is probably somewhat premature given the current state of maglev technology development in the U.S. Cooperative R & D programs will lead to the development of U.S. maglev technology, which will in turn benefit at the commercialization stage from loan guarantees and other financial incentives to attract the enormous amounts of private capital that will be necessary to put maglev systems in place in the U.S. For now, the federal government should focus its efforts on serving as the financial catalyst for the development of a U.S. technology and on ensuring that regulatory and institutional barriers do not impede implementation of viable maglev systems. MAGLEV USA would be pleased to assist the federal government in identifying any regulatory or institutional barriers which need to be eliminated to facilitate implementation of such systems.

Recognizing that the federal government must serve as a catalyst for maglev development, we are left with a question as to the organizational structure that should be established at the federal level to facilitate maglev development. At present, a working group composed of representatives from DOT, DOD and DOE is attempting to develop a federal program for maglev development. However, management by committee is not an efficient way to run an extremely complex technology development program.

As we are becoming painfully aware, maglev technology crosses many agency jurisdictions. Within the Department of Transportation alone, safety concerns fall to the Federal Railroad Administration, use of highway rights-of-way to the Federal Highway Administration, and potential airport connections to the Federal Aviation Administration. The Department of Energy has been charged with the mission of developing superconducting technologies which will likely be employed in second generation maglev design. The Army Corps of Engineers is responsible for developing an overall plan for maglev implementation. Each of these three agencies, with the support of the national laboratories and other agencies such as EPA, will provide essential input for U.S. maglev development.

S.2286 would establish a High-Speed Ground Transportation Office within the Federal Railroad Administration to coordinate the development and implementation of maglev in the U.S. Due to the extensive involvement of agencies other than DOT in maglev development, we would like to suggest the establishment of a joint program office of maglev development that would cut across agency jurisdictional lines and would manage the entire U.S. maglev development effort. The best example of this approach may be the joint program office established for the development of the National Aerospace Plane (NASP), involving NASA, the Air Force and the Navy. Like maglev, NASP involves R & D for a high- tech project and the participation of an industry consortium.

In our view, a joint program office established to coordinate a government/private sector effort is the most expedient and efficient approach to "leap frog" foreign technology and achieve an advanced U.S. maglev system. The joint office should have authority to award contracts and to hire or contract for necessary technical expertise and should coordinate its efforts with each participating or interested federal agency. As required, existing agencies could detail personnel to the joint program office on long term assignments. With a joint program office, decisions could be made faster, responses to changing events could be formulated more effectively, and industry participation could be coordinated more efficiently.

In closing, let me say that MAGLEV USA is encouraged and excited by the renewed federal interest in maglev transportation. With the continuing interest of Congress and the Administration, we believe that the earlier successes of the U.S. in telecommunications development can now be duplicated in the field of maglev transportation. MAGLEV USA's fondest wish is to participate in the demonstration of U.S. maglev technology. As the Washington to Baltimore telegraph line served to stimulate the development of a telecommunications industry in the U.S., perhaps a Washington to Baltimore maglev system can serve to stimulate the development of a U.S. maglev industry.

Mr. Chairman, that concludes my testimony. I would be pleased to address any questions you or other Members of the Subcommittee may have.

Senator EXON. Thank you, Mr. Boardman.

Dr. Yurek, we will hear from you.

STATEMENT OF GREGORY J. YUREK, PRESIDENT AND CEO, AMERICAN SUPERCONDUCTOR CORP., REPRESENTING THE COUNCIL ON SUPERCONDUCTIVITY FOR AMERICAN COMPETITIVENESS

Dr. YUREK. Thank you, Mr. Chairman. My name is Gregory J. Yurek, and I am president and CEO of American Superconductor Corporation, located in Watertown, Massachusetts. American Superconductor was founded in 1987 to develop and manufacture conductors and components made from ceramic superconductors for use in energy and transportation systems. Among the applications for the company's products are cables for electric power transmission, conductors for energy storage, and powerful superconducting magnets for magnetic levitation transport.

I am appearing before you today as a member of the Board of Directors of the Council on superconductivity for American Competitiveness, also known as CSAC. CSAC was established in 1987 as a national forum for leaders in industry, government, and academia who are engaged in the development and application of superconductivity in the United States in response to both the commercial potential and the competitive challenge of superconducting maglev the CSAC board of directors established the Maglev 2000 Task Force. Maglev 2000 seeks to accelerate the establishment of a domestic maglev industry that could design and build a superconducting maglev system on American soil in this decade.

Mr. Chairman, there is no doubt that magnetically levitated transportation systems will be built and operated in the United States. CSAC expects that the first generation of maglev systems in the United States will not employ superconducting technology, but will, in fact, use German electromagnetic technology and Japanese financing.

The first generation, commercially mature German maglev and the ubiquitous Japanese financing have combined to overwhelm what is at this point a nonexistent American competition. Nevertheless, CSAC commends the American partners in these projects because we strongly believe that success in these endeavors will convince the American public and government leaders and private investors of the safety and efficiency of maglev transportation.

CSAC is equally certain, however, that the second generation, purely American designed and built maglev system will utilize superconducting technology. The Maglev Technology Advisory Committee, MTAC, reported to the U.S. Senate in June of 1989 that second generation maglev systems based on superconducting magnets appear more promising than systems based on electromagnets because they would be easier and cheaper to install and maintain, and they would be more reliable.

Also, the MTAC group concluded that implementation of superconducting maglev would provide a major push toward commercialization of superconductivity across a wide range of applications, not just maglev.

There is a narrow window of opportunity for the United States to enter the commercial race for the next generation of maglev. An American design, second generation superconducting maglev system could serve as a potent competitor in the U.S. market as well as in worldwide markets.

But the Federal Government must act as a catalyst to bring together public and private interests to accomplish this mission.

The Federal Government has essentially two primary responsibilities with regard to maglev development in the United States. The first is to establish an agency to develop and coordinate a regulatory regime which will allow for implementation of current generation maglev systems, and the second is to promote the development of a domestic maglev industry which can leapfrog the international competition by utilizing superconducting technology.

The CSAC Maglev 2000 Task Force believes that S. 2286, the Magnetic Levitation Transportation Act of 1990 is a good first step in meeting the Federal Government's responsibilities in this area. There is an obvious need for a comprehensive Federal policy for the development of maglev which will require the establishment of a new federal agency to regulate a new form of transportation.

It is also our belief that a domestic maglev industry will never get off the ground without an effective public/private partnership with cost sharing aimed at jump starting a competitive U.S. superconducting maglev industry.

CSAC is concerned, however, that the level of dedicated funding specified in S. 2286 may be inadequate to the task of effectively competing with cash-rich technically advanced foreign competitors. Bear in mind that the Maglev Technology Advisory Committee recommended $750 million over a six-year period to develop and test the superconducting maglev.

The CSAC Maglev 2000 Task Force also recognizes the need for innovative financing programs to help mitigate the large capital costs associated with developing maglev systems. We believe that Senator Reid's bill, S. 1898, the Maglev Guarantee Pilot Program Act, is a unique and forward-thinking approach to this problem. CSAC has no objection in principle to Federal legislation which contains carefully constructive loan guarantees for investment in maglev development.

CSAC believes that superconducting maglev could be an ideal flagship project for the United States, one that would signal the reawakening of our technological prowess. From the standpoint of American jobs, economic growth and competitiveness, energy efficiency, cleaner air, downstream technological spin-offs and the providing of a draw for research in superconductivity, maglev just makes sense.

Mr. Chairman, about 30 years ago President Kennedy addressed a joint session of Congress to unveil his dramatic program to land an American on the moon. America at that time was faced with an international competitiveness challenge, one with both political and technological implications.

I would submit that today we are confronted with an equally daunting challenge, building from scratch a world class competitive maglev industry in the United States. Meeting this challenge will require the commitment of substantial economic and technical resources. Without this commitment we could witness yet another American invented technology being commercially exploited by our foreign competitors.

On that night 30 years ago President Kennedy said there is no sense in going ahead unless we are prepared to do the work and bear the burdens necessary to make it successful.

Mr. Chairman, the CSAC Maglev 2000 Task Force and many of our colleagues here today are eager to do work and bear burdens to get America back in the maglev race, to win that race, and to help America meet this latest competitiveness challenge. Thank you.

[The statement follows:]

TESTIMONY OF

DR. GREGORY J. YUREK
PRESIDENT & CEO
AMERICAN SUPERCONDUCTOR CORPORATION

ON BEHALF OF THE

COUNCIL ON SUPERCONDUCTIVITY
FOR AMERICAN COMPETITIVENESS
MAGLEV 2000 TASK FORCE

Good afternoon Mr. Chairman. My name is Gregory J. Yurek and I am President and CEO of American Superconductor Corporation, located in Watertown, Massachusetts. American Superconductor was founded in 1987 to develop and manufacture conductors and components made from ceramic superconductors for use in energy and transportation systems. Among the applications for the company's products are cables for electric power transmission, conductors for energy storage, and powerful superconducting magnets for magnetic levitation transport.

I am appearing before you today as a member of the Board of Directors of the Council on Superconductivity for American Competitiveness, also know as CSAC. CSAC was established in 1987

as a national forum for leaders in industry, government, and academia who are engaged in the development and application of superconductivity in the United States. CSAC is a non-profit, non-partisan organization whose primary mission is to accelerate the commercial application of superconductivity across a broad range of technologies.

One of the most exciting and potentially profitable applications of superconductivity is magnetically levitated transportation systems (maglev). In response to both the commercial potential and the competitive challenge of superconducting maglev, the CSAC Board of Directors established the MAGLEV 2000 Task Force, of which my company is an active participant. MAGLEV 2000 seeks to accelerate the establishment of a domestic maglev industry which could design and build a superconducting maglev system on American soil in this decade. I have included as an attachment to this statement an overview of the advantages and benefits of superconducting maglev that was prepared by the MAGLEV 2000 Task Force.

First Generation Electromagnetic Maglev

Let me clearly state that CSAC fully expects that the first generation of maglev systems that are built and operated in the United States will not employ superconducting technology. It is

very likely that the first maglev systems built and operated in the United States will use German electromagnetic technology and Japanese financing. The first generation, commercially mature, German maglev and the ubiquitous Japanese financing have combined to overwhelm what is, at this point, non-existant American competition. Notwithstanding what this implies about American competitiveness, CSAC commends the efforts of those American partners who are engaged in the California-Nevada, Florida, and Pittsburgh maglev projects, because we strongly believe that success in these endeavors will convince the American public, government leaders, and private investors of the safety, reliability, and efficiency of maglev transportation. Also, American participation in these projects will result in valuable experience in the design and construction of maglev guideways, which is the major portion of the system implementation.

Second Generation Superconducting Maglev

CSAC is equally certain, however, that the second generation, purely American designed and built maglev system will utilize superconducting technology. CSAC particpated in the deliberations of The Maglev Technology Advisory Committee (MTAC), which explored the key issue of maglev development and existing rights-of-way along the Interstate Highway system. MTAC reported to the U.S. Senate in June of 1989 that "second-generation maglev systems based on superconducting magnets appear more promising than systems based on electromagnets for three reasons: 1) superconducting maglev vehicles will be lighter, which will result in lighter, lower cost guideways; 2) large clearances between the vehicles and the guideway will make guideway installation and maintenence easier and cheaper; and 3) the guideway propulsion system is simpler and cheaper". It is also significant to note that the MTAC group concluded that "implementation of superconducting maglev would provide a major push toward commercialization of superconductivity for a wide range of applications, including electric power generation, transmission, and storage; industrial processing; computers and electronics". It would also provide a push toward development and commercialization of many other, unforseen applications of superconductivity as we enter the new "Age of Magnetism".

The Need for Alternative Transportation Systems

Mr. Chairman, there is no doubt that magnetically levitated transportation systems will be built and operated in the United States. The increased mobility of the American people has led to relentless growth in congestion on our highways and in our airspace. Fossil fuel combustion in our cars and airplanes continues to pollute our environment. Supplies of liquid fuels are dwindling. These factors mandate that the United States must quickly develop a high-capacity, clean, and energy efficient alternative transportation system. Maglev systems, operating at speeds up to 300 miles per hour and at distances of up to 600 miles, can effectively relieve congestion from intermediate range highway and airline traffic, without imposing negative impacts on the environment or energy supply.

The Appropriate Federal Role in Maglev Development

The federal government is making a good, albeit late, start in constructing a legal and regulatory regime that will allow for the implementation of first generation, foreign-owned maglev technology in American corridors. The White House, the Congress, the Federal Railroad Administration, and the Army Corps of Engineers are now beginning to address this crucial public policy issue in a coordinated fashion.

The real question, Mr. Chairman, is can America develop and nurture a domestic maglev industry in time to compete in our own market? The answer is yes, if we can muster the political will, the economic resources, and the technical talent. It is obvious today that the German Transrapid technology has a head-start in commercial applications in the United States and around the world. Even more compelling is the fact that the Japanese will pour $3 Billion into their superconducting maglev program over the next 5 years, with the goal of operating the world's first commercial superconducting maglev service in Hokkaido in 1994.

There is a narrow window of opportunity for the United States to enter the commercial race for the next generation of maglev. An American designed, second-generation superconducting maglev system can serve as a potent competitor in the U.S. market as well as the worldwide market. The federal government must act as a catalyst to bring together public and private interests to accomplish this mission.

The federal government has essentially two primary responsibilities with regard to maglev development in the United States: 1) establish an administrative and policy-making body to develop and coordinate a regulatory regime which will allow for implementation of current generation maglev systems; and 2) promote industry-government partnerships and provide dedicated research funding for the development of a domestic maglev industry which can leap-frog the international competition by utilizing superconductor technology.

Legislation: S. 2286

The CSAC MAGLEV 2000 Task Force believes that S. 2286, the Magnetic Levitation Transportation Act of 1990 is a good first step in meeting the federal governments responsibilities in this area. There is an obvious need for a comprehensive federal policy for the development of maglev, which will require the establishment of a new federal agency to regulate a new form of transportation. It is also our belief that a domestic maglev industry will never get off the ground without an effective public-private partnership, with cost-sharing, aimed at "jump-starting" a competitive U.S. superconducting maglev industry. CSAC is concerned, however, that the level of dedicated funding specified in this legislation may be inadequate to the task of effectively competing with cash rich, technically advanced, foreign competitors. The Maglev Technology Advisory Committee recommended $750 million over a period of six to seven years for developing, testing, and demonstrating maglev technologies. CSAC also advocates, as an economic adjunct to dedicated funding, a reduction in the capital gains tax and the creation of a permanent research and experimentation tax credit.

Legislation: S. 1898

The CSAC MAGLEV 2000 Task Force also recognizes the need for innovative financing programs to help mitigate the large capital costs associated with developing maglev systems. We believe that Senator Reid's bill, S. 1898, The Maglev Guarantee Pilot Program Act, is a unique and forward thinking approach to this problem.

CSAC has no objection in principal to federal legislation which contains carefully constructed loan guarantees for investments in maglev development.

The Competitiveness Challenge to America

Last June, Commerce Committee Chairman Ernest Hollings stood on the Senate floor to decry America's eroding lead in technology. Senator Hollings said "the United States is no longer the clear leader in industrial technology. We continue to lead the world in basic science, in new ideas, and in Nobel Prizes. But we are losing the lead in key commercial technologies, and our share of important world markets continues to drop at an alarming rate. We are rapidly becoming a second-rate industrial power, with all that implies for both national defense and economic prosperity."

CSAC believes that superconducting maglev could be an ideal "flagship" project for the United States, one that would signal the reawakening of our technological prowess. From the standpoint of American jobs, economic growth and competitiveness, energy efficiency, cleaner air, and downstream technological spinoffs, maglev makes sense. The development of an American superconducting maglev industry offers the United States a unique opportunity to seize a potentially profitable new market. The challenge is to structure the appropriate incentives to industry to enter the commercialization picture, even though the short-term profit potential is limited.

Mr. Chairman, about 30 years ago, President Kennedy addressed a Joint Session of Congress to unveil his dramatic program to land an American on the Moon. America at that time was faced with an international competitiveness challenge, one with both political and technological implications. I would submit that today we are confronted with an equally daunting challenge - building from scratch a world class, competitive maglev industry in the United States. Meeting this challenge will require the committment of substantial economic and technical resources. Without this committment, we could witness yet another American-invented technology to be commercially exploited by our foreign competitors.

On that night 30 years ago, President Kennedy said: "There is no sense in going ahead, unless we are prepared to do the work and bear the burdens necessary to make it successful."

Mr. Chairman, the CSAC MAGLEV 2000 Task Force, and many of our colleagues here today, are eager to do work and bear the burdens to get America back in the maglev race, to win that race, and to help America meet this latest competitiveness challenge.

Senator EXON. Thank you very much.

I am very pleased to welcome you here now, Mr. Pattison. Please continue, and your statement is already a part of the record.

STATEMENT OF ROBERT PATTISON, DIRECTOR, PARSONS, BRINCKERHOFF, QUADE & DOUGLAS, HERNDON, VA, REPRESENTING THE HIGH SPEED RAIL ASSOCIATION

Mr. PATTISON. Thank you, Mr. Chairman.

On behalf of the High Speed Rail Association I thank you for this opportunity to appear. I am Bob Pattison, the Technical Director of Railroads for Parsons, Brinckerhoff, a large multi-disciplined engineering firm, and I am also the Vice Chairman of the High Speed Rail Association.

I spent 32 years railroading. I have seen a lot of changes, and I welcome magnetic levitation into the transportation field.

High Speed Rail Association has members from all of the various disciplines, financial, engineering, labor, universities, construction and even aerospace. My colleague, Paul Reistrup, President of the Monongahela Railway, and the Chairman of High Speed Rail Association appeared before your committee back in October and brought you up to date on what is happening with high-speed rail in this country and the various projects. And I would like to bring you further up to date, on those projects.

The first one using magnetic levitation is Orlando Airport to International Drive. Certification for the Transrapid Maglev demonstration is targeted for the fall of 1990.

The California-Nevada project, Anaheim to Las Vegas, has issued a request for proposal, RFP, in January of this year. The final response is due in July, and the developer, whoever it may be, has the option of both maglev and steel wheel/steel rail. The selection will be made late this year.

Texas has created a new High Speed Rail Authority. They are due to issue an RFP in 1990 for the Houston-Dallas-San Antonio triangle.

The Cleveland-Columbus-Cincinnati project in Ohio there has been a franchise proposal made that the State authority by a private consortium for a construction and operating plan. The submission to the Governor and the Assembly is due in 1991.

The other project in Florida is the high-speed rail project from Miami to Orlando to Tampa. The Florida High Speed Rail Corporation has submitted application for a franchise project. This includes design, construction, operations and financing, the whole package, and that has been submitted in Florida for an advanced wheel on rail concept by Asea Brown Boveri, the award is due in September of 1991.

There are several other projects such as the one in Pennsylvania, and it is currently proposed for magnetic levitation from Harrisburg to Pittsburgh with steel wheel/steel rail currently discussed for Philadelphia to Harrisburg.

The State of Washington is proposing a new high speed project, from the present Seattle-Tacoma airport to Moses Lake, a new regional airport. They are considering magnetic levitation.

Others are: Boston to New York, a new one Minneapolis to Chicago through Milwaukee, Detroit-Chicago is well underway, Los Angeles up the San Joaquin Valley to Sacramento, and the very recent one is from downtown Pittsburgh to the new midfield terminal at Pittsburgh airport.

There are many corridors that lend themselves to steel wheel/steel rail. High Speed Rail Association urges this subcommittee to consider expanding S. 1898 to include all intercity high-speed rail.

High-speed rail is needed to reduce highway congestion and pollution now. There is a need for Federal loan guarantees. The projects that are under consideration, 80 percent of the work is infrastructure work which will be done in the U.S. by U.S. firms; 20 percent is equipment, and if that is foreign equipment, it will be assembled and modified in this country.

We strongly endorse S. 1898 and S. 2286. These are needed to stimulate the innovative spirit that built this country, and should do so again. It is time, though, for us to put behind us the study stages on projects and get going with a real design and the real construction of projects that are going to help the environment, the congestion on highways and in the air that will get people to where they want to go.

Mr. Chairman, we thank you very much for this opportunity to testify. The High Speed Rail Association would like to formally extend an invitation to you and your committee to attend our next annual, our seventh annual high-speed rail convention which is May 7–10 in San Antonio.

Again, I thank you very much.

[The statement follows:]

STATEMENT OF ROBERT K. PATTISON

Mr. Chairman and members of this distinguished Subcommittee, on behalf of the High Speed Rail Association (HSRA) I thank you for providing us with an opportunity to testify this afternoon. My name is Robert K. Pattison, and I am Technical Director-Railroads for the engineering firm of Parsons Brinckerhoff Quade & Douglas, Inc. I also serve as Vice Chairman of HSRA, and it is in this latter capacity in which I appear today.

HSRA represents a strong collaboration of members of the financial community, the engineering and design profession, labor unions, the construction industry, rail equipment manufacturers and suppliers, service providers and professionals, colleges and universities, and national, state and local government units, all dedicated to advancing high speed rail passenger transportation in the United States. By "high speed rail" I include both magnetic levitation and advanced wheel on rail systems, as both technologies herald the promise of speedy, safe, reliable and comfortable surface transportation between destinations 100 to 600 miles apart. Recently, members of the aerospace community have joined our organization, highlighting HSRA's broad and expanding constituency which also includes substantial international participation.

As Technical Director-Railroads for Parsons Brinckerhoff for over a decade, as the former president of the Long Island Railroad, and with more than 30 years of professional experience with the New York Central Railroad and its successors in engineering, operations, and management, I have never been more impressed than I am today with the potential for high speed rail to help alleviate our current crises in transportation and the environment. State and regional projects across the country which offer the hope of implementing maglev and existing wheel on rail technologies to improve our present congestion would benefit greatly from the federal support proposed by the legislation pending before the Subcommittee. At the same time, to maintain the long-term global competitiveness of the United States, the federal government must accelerate the pace of domestic research in maglev technology. Only with a greatly expanded federal program of research and development in maglev can we as a country hope to meet the transportation challenges of tomorrow.

My testimony will first apprise the Subcommittee of the present status of the various state and regional high speed rail initiatives across the United States. HSRA supports enactment in its present form of S. 1898, the Mag-Lev Guarantee Pilot Program Act. In addition to stimulating the formation of a domestic maglev industry, however, expansion of the proposed federal guarantees to the state and regional projects now underway would significantly aid the ability of the private sector to help meet our transportation needs. HSRA urges that S. 1898 be expanded to include loan guarantee authority for high speed rail intercity facilities not exclusively manufactured and produced in the United States.

HSRA also strongly supports enactment of S. 2286, the Magnetic Levitation Transportation Act of 1990, which will stimulate domestic research and development of high speed ground transportation technologies. In order to help achieve the goals of this legislation, HSRA offers several narrow technical modifications intended to heighten the potential attractiveness to the private sector of the public/private cooperative agreements envisioned in S. 2286.

I. HIGH SPEED RAIL CORRIDOR EFFORTS IN THE UNITED STATES ARE ACCELERATING

My colleague, Paul H. Reistrup, President of the Monongahela Railway Company, and Chairman, HSRA, previously appeared before this Subcommittee on October 17, 1989 and described the historical public acceptance of rapid rail surface transportation, the emergence of Amtrak and improvements on the Northeast Corridor, and the status of the various regional high speed rail initiatives. I shall add here the developments within the past five months concerning a few of the leading projects across the country now approaching the implementation stage:

- Florida: Application of the Florida High Speed Rail Corporation for a franchise to construct an advanced wheel on rail line using ASEA Brown Boveri technology and connecting Tampa-Orlando-Miami continues under review. Franchise award is targeted for September 1991. Certification of a separate proposed Transrapid maglev demonstration in Central Florida is targeted for Fall 1990.

- Ohio: Ohio Railway Organization, Inc. to prepare, in conjunction with the Ohio High Speed Rail Authority, a construction and operation plan encompassing a specific technology and connecting Cleveland-Columbus-Cincinnati, for submission to the Governor and Assembly, 1991.

- California-Nevada: Requests for proposals for the Las Vegas-Anaheim route issued January 1990 by the California-Nevada Superspeed Train Commission. Final responses due July 1990, with a developer (either wheel on rail or maglev) to be selected by late 1990.

- Texas: The recently named Texas High Speed Rail Authority intends to issue a request for proposals in 1990 for construction of a Houston-Dallas-San Antonio "Triangle" high speed line.

High speed rail corridor initiatives elsewhere in the d States are similarly advanced. The Pennsylvania High Speed Commission recently completed a study recommending a sburg-Pittsburgh maglev connection. Washington State is now wing the possibility of a 178-mile high speed rail connection the present Seattle/Tacoma airport to a proposed new -airport at Moses Lake, Washington, as the basis for a new nal system in the Pacific Northwest. Studies have also been eted or are in progress for Boston-New York, Minneapolis-ukee-Chicago, Detroit-Chicago, and Los Angeles-Fresno-Bay Sacramento high speed systems.

Among the most encouraging of these recent developments e proposal now pending in Central Florida to construct a v system between Orlando International Airport and the national Drive theme park area. If certified as expected by nd of this year, this system (which will use Transrapid v technology) could be operational by late 1994 as the 's first high speed maglev line in commercial service.

The recent formation of Maglev, Inc., a public/private rtium based in Pittsburgh and led by Carnegie Mellon

University, is also worthy of the Subcommittee's attention. By creating a new maglev manufacturing and construction industry in Pittsburgh, Maglev, Inc. intends to revitalize the industrial infrastructure of all of Allegheny County. The initial objective of the consortium will be to build and operate a 19-mile maglev demonstration project linking downtown Pittsburgh and the new midfield terminal being constructed at the Greater Pittsburgh airport. Maglev, Inc. is the first public/private venture in the United States dedicated to the manufacture and production of high speed maglev technology.

These nationwide efforts represent a groundswell of emerging support across the United States for high speed rail and its potential to help ease our congested air and highway transportation modes. Members of HSRA, who are actively involved in every one of these proposed projects as planners, administrators, or participants, above all recognize the alleviation of suburban and airport ground congestion, and the environmental benefits in terms of clean air and energy savings, to be gained from institution of a new, clean electrically-based system of transportation encompassing both advanced wheel on rail and maglev technologies.

It is with this perspective -- as proponents of all high speed ground transportation technologies and applications -- that HSRA supports the beneficial legislation pending before the Subcommittee.

II. HSRA SUPPORTS ENACTMENT OF S. 1898, MAG-LEV PILOT PROGRAM GUARANTEE ACT

A. Federal Loan Guarantees Represent A Novel and Necessary Stimulant to Establishing A Domestic Maglev Manufacturing Industry

In his remarks introducing S. 1898 in November 1989, Senator Reid aptly described the obstacles facing U.S. corporations seeking to invest in research and development of domestic maglev technologies. By guaranteeing investments of state and local public employee pension plan fiduciaries in domestically produced intercity high speed rail facilities in the amount of $2 billion per year, up to a total of $10 billion, S. 1898 offers project sponsors access to sources of financing not otherwise available. S. 1898 also comports with the obligation of public pension plan fiduciaries to assemble diversified and conservative portfolios with long-term growth potential. HSRA submits that no investment could be more beneficial for this country as a whole than the federally guaranteed use of our state and local public employee pension funds to improve the nation's transportation infrastructure and long-term competitiveness.

HSRA therefore strongly supports enactment of S. 1898. The private sector alone cannot by itself invest the substantial sums necessary to produce a domestically designed second-generation maglev technology to surpass the significant first-generation foreign achievements supported at a cost of billions of marks and yen. S. 1898 offers a novel and innovative financial stimulant to U.S. industry to establish a domestic maglev industry to ensure American long-term competitiveness, and HSRA supports this legislation as submitted. In addition, modifications to S. 1898, as outlined below, might also be considered.

B. HSRA Urges That the Federal Guarantees of S. 1898 Be Expanded

HSRA notes preliminarily that maglev systems may be introduced in revenue service initially at distances of less than several hundred miles. For example, the proposed maglev demonstration project to be constructed in Central Florida would connect Orlando International Airport with the International Drive theme and resort area, with a guideway length of less than 15 miles. Similarly, Maglev, Inc.'s planned maglev demonstration envisions a 19-mile link between downtown Pittsburgh and the nearby airport as the first stage of a proposed regional system. Application of maglev technology for these shorter distances, at least initially, lowers capital costs and permits a shorter, more controlled revenue testing environment when in full service.

Accordingly, HSRA requests the Subcommittee to consider the shorter initial maglev systems as proposed ultimately for the fixed guideway rail transportation of passengers and their baggage between metropolitan statistical areas (within the definition of Sec. 143(k)(2)(B) of the Internal Revenue Code of 1986) to be included within the scope of the federal guarantees contemplated by S. 1898. This could be accomplished by inserting in Sec. 2(h)(1) of the bill, after "Internal Revenue Code of 1986)" and before "using vehicles", the following: ", or within such metropolitan statistical areas if in the determination of the

Secretary the demonstration of high-speed intercity rail facilities would be favorably advanced,".

HSRA also urges the Subcommittee to consider expanding S. 1898 by making a portion of the federal guarantees envisioned available to all intercity high speed rail facilities, regardless of origin of manufacture. HSRA recommends this approach for the following reasons:

- High speed rail is needed now to alleviate our crowded highways and airports. The President's national transportation policy recognizes the danger to our economic well-being from this congestion, and specifically recommends introduction of high speed rail to the United States as a way of keeping our transportation industry strong and competitive.

- Substantial plans for implementation of high speed rail are already underway across the country. Many of these projects, as highlighted earlier, are significantly advanced along the hard path to implementation, construction and operation. Availability of federal loan guarantees to these projects would provide the final piece to the financial puzzle that in some proposals has taken the private sector a decade to assemble.

- For every high speed rail project now under consideration, direct and indirect infrastructure costs account for approximately 80 percent of the capital investment required. High speed rail rolling stock and trainsets account for at most 20 percent of the total capital investment. Thus, the vast portion of the new economic development, construction activity, and employment generation accompanying any of the $2 to $5 billion high speed rail projects now under consideration will take place entirely in the United States. And, as the Pittsburgh initiative develops, and relationships of foreign technology suppliers with other domestic manufacturers expand, high speed intercity rail trainsets could be assembled in this country even as the domestic maglev technology manufacturing program begins to energize.

HSRA asks only for a level playing field. The highway and air modes receive substantial direct federal support not currently available to high speed rail. While the 1988 amendments to the Internal Revenue Code of 1986 introduced tax-exempt bond financing for high speed rail projects, such financing is subject to overall state volume caps and is thus of relatively limited benefit. Provision of federal loan guarantees for all high speed rail intercity facilities would help equalize the substantial advantage of highway and aviation proponents, and would enable the implementation of the most suitable transportation technology in each of the various regions of this country requiring new intercity motive capacity.

III. HSRA SUPPORTS ENACTMENT OF S. 2286, MAGNETIC LEVITATION TRANSPORTATION ACT OF 1990

HSRA strongly endorses S. 2286, which would centralize within the Federal Railroad Administration oversight of existing and future high speed intercity rail facilities and provide additional stimulus for U.S. industry to invest in research and development of maglev and related generic technologies.

A. HSRA Supports Creation of a Federal Office of High-Speed Ground Transportation

HSRA believes that creation of an Office of High Speed Ground Transportation within FRA would enhance the existing federal commitment to seeing high speed rail systems implemented swiftly and safely with a minimum of obstacles. HSRA hopes that such an Office within the Department of Transportation would continue to nurture the productive relationships already established with the U.S. Army Corps of Engineers, the Department of Energy, and other interested agencies to further federal review of maglev research and development opportunities.

B. HSRA Endorses Public/Private Research and Development Agreements for Maglev

HSRA supports enactment of Section 4 of S. 2286, which would grant the Secretary of Transportation the authority to enter into "cooperative research and development agreements" with United States companies to conduct research in maglev technology and transfer that research "and basic generic technologies" to industry. Sec. 4(a). Under such agreements, the Secretary could agree to provide up to 50 percent of the cost of any project under the agreement. Sec. 4(b). In addition, the bill provides that the research, development, or utilization of any technology pursuant to such an agreement, including the terms of licensing and resulting royalties, shall be subject to the provisions of the Stevenson-Wydler Technology Innovation Act of 1980 ("Stevenson-Wydler Act"), Pub. L. No. 96-480 (codified at 15 U.S.C. § 3701 *et seq.*), as amended by the Federal Technology Transfer Act of 1986 ("Technology Transfer Act"), Pub. L. No. 99-502 (codified at 15 U.S.C. § 3710a *et seq.*), Sec. 4(c).

The intent of S. 2286 is fully consistent with the Stevenson-Wydler and Technology Transfer Acts. Legislative history to the Stevenson-Wydler Act indicates that its purpose was "to build links between generators of knowledge (universities and Federal laboratories) and users of knowledge (industry and State and local governments)." H. Rep. 96-1199 at 3 (1980). Legislative history to the Technology Transfer Act demonstrates that Congress determined to expand Stevenson-Wydler to grant federal agencies the authority in turn to authorize federal laboratories within their jurisdiction to enter into cooperative research and development agreements without agency approval. 15 U.S.C. § 3710a(a); *see* H. Conf. Rep. No. 99-953 at 15.

HSRA supports the intention of S. 2286 to encourage the creation of cooperative research and development agreements, commonly referred to as "CRADAs", for maglev research and development. As discussed below, however, HSRA suggests several narrow and purely technical enhancements to the legislation in order to make entering into such cooperative agreements even more attractive for industry.

Under a CRADA, which by definition involves a federal laboratory, the federal government may not contribute any funds to a non-federal entity. 15 U.S.C. § 3710a(d). The government's contributions are limited to personnel and other resources, as should important technology exist in federal laboratories, private industry may want to buy in to rights in such technology.

Another valuable mechanism for encouraging private sector involvement in maglev technology -- one which does not require the participation of federal laboratories -- is a "funding agreement" as described in the federal patent statute, as amended by the Bayh-Dole Patent and Trademark Amendments of 1980 ("Bayh-Dole"), Pub. L. No. 96-517, codified at 35 U.S.C. § 201 *et seq*. Under a "funding agreement," the non-federal recipient of federal funds automatically gets the right to ownership of any patentable inventions resulting from research conducted under the agreement absent "exceptional circumstances." 35 U.S.C. § 202(a) (small businesses and nonprofit organizations); Executive Order Feb. 18, 1983 (large businesses).

In contrast, under a CRADA, the disposition of rights is left up to negotiation; the federal laboratory *may* agree to give up its ownership rights, or (and more frequently) to grant in advance licensing rights. 15 U.S.C. § 3710a(b). In addition, every CRADA must provide for payment of a percentage of any royalties received for licensing of a government-owned invention to the individual inventor. 15 U.S.C. § 3710b.

HSRA believes that the intent of the drafters would be best served by clarifying Secretarial authority to enter into both maglev CRADAs (for work done in cooperation with a federal laboratory) and maglev funding agreements. This could be accomplished with the following statutory language:

> Sec. 4(a), add after "3710a)" the following: ", or funding agreements (as defined by section 6(a) of the Bayh-Dole Patent and Trademark Amendments of 1980, 35 U.S.C. § 201),".
>
> Sec. 4(b), delete "an" before "agreement" and insert in lieu thereof: "a funding".

Sec. 4(c), delete "an" and insert in lieu thereof: "a cooperative research and development".

Sec. 4(d), change to Sec. 4(e), and insert immediately before the following as new Sec. 4(d):

> "(d) The research, development, or utilization of any technology pursuant to a funding agreement under subsection (a), including the determination of all licensing and ownership rights, shall be subject to the provisions of the Bayh-Dole Patent and Trademark Amendments of 1980 (35 U.S.C. § 201 et seq.)."

The above proposed alternative language has the effect of making clear that in accordance with Bayh-Dole, research outside the federal laboratory environment is to be encouraged by granting outside collaborators ownership rights in the technology. Private industry will therefore have a much greater incentive to participate in the maglev research and development process envisioned by S. 2286.

In suggesting the above technical alternative constructions, HSRA wishes to emphasize that it is hoping only to make a good thing better. As presently proposed, S. 2286 will go far toward boosting the pace of domestic maglev research and development. Adoption of these proposed minor changes would serve to make this landmark legislation even more appealing.

Conclusion

Mr. Chairman, as you know, at the White House ceremony two weeks ago announcing the National Transportation Policy, the President hailed the Administration's "strategy to unleash the creative genius of American technology . . . which took us to the moon" and which now "must support and encourage advanced technologies in the whole field of transportation, from magnetically levitated trains to intelligent vehicles in highways to advanced materials engineering." The legislation pending before the Subcommittee upon which we have testified would notably advance this worthy goal. HSRA urges that both S. 1898, the Mag-Lev Guarantee Pilot Program Act, and S. 2286, the Magnetic Levitation Transportation Act of 1990, be reported favorably incorporating the proposed technical perfections.

Mr. Chairman, we thank you very much for providing us with the opportunity to testify. HSRA would like formally to extend an invitation to you and the members of the Subcommittee to visit with us at our seventh annual international convention, to be held May 7-10, 1990 in San Antonio, Texas.

Again, thank you, and I would be pleased to answer any questions you or your colleagues may have.

Senator EXON. Thank you for the invitation. We will take it under advisement, Mr. Pattison.

First, I will have a few questions for this distinguished panel, and would like to advise them that there are likely to be other written questions that will be submitted to you and we would appreciate your responding as promptly as you can for inclusion in the record.

Let me just follow on with what you were talking about, Mr. Pattison. Do you see rights-of-way of our interstate system as possible right-of-ways for either high speed or maglev and also what have you done in the railroad industry, because we have an awful lot of railroad right-of-way running in this country.

It seems to me that in many areas of country, we have already cut these cities up with railroads and interstates and so forth and so on, not only from the standpoint of the cost of acquiring new right-of-way, but also to keep from converting additional precious land into rights-of-way.

Have you studied the proposition, your organization, as to whether or not most of either a high-speed or a maglev system could somehow be accommodated within railroad and interstate or other highway rights-of-way?

Mr. PATTISON. Yes, we have looked at that, Senator, and quite like Administrator Carmichael said, the curvature on many of those lines that are not in use now prohibits high speed rail or magnetic levitation, but there are some that have great possibility.

We looked at, as an example, Dallas to Houston using the Burlington Northern right-of-way and that is still a possibility to do. So there are areas that these rights-of-way could be used.

Currently, and not high speed, but many of these rights-of-way are being studied or used for commuter rail in and out of the major cities.

Senator EXON. Well, even if you have a road that snakes down the way, I would think you would generally, maybe you could get some kind of a straight line on it and have a minimum of a requirement, rather than going out across and start a whole new right-of-way.

It seems to me like, at least those things could be looked at, but there are other things to do first.

Mr. PATTISON. Yes they are being looked at. Whole corridors between major cities provide enough ridership, we are looking at the rights-of-way that are available.

Senator EXON. Let me ask you, Dr. Danby, in your testimony you said that maglev has a strong support by the Japanese government. Are you aware of any opposition to maglev from proponents or supporters of the Bullet Train, or do they seem to want to proceed with both?

Dr. DANBY. No, sir, the Japanese railway, which used to be Japanese National Railway, is now a series of companies, and that is the J.R. Tokai Line. They are the builders of this, principally, as well as the owners of the Bullet Train. In fact, less than a quarter of the money comes from the local and national government. It is mostly from the railroads. They are very successful. They have hotels, they have stores at the stations. I mean, they have found a way to be very viable and to get that tremendous return. They estimate on this new line the return to society will be 10 times its enormous cost because of all of these tunnels. The trick, as we all know, is somehow to couple some of the money from resulting growth back into the entity who builds it.

Well, they accomplish this in Japan. They are doing both the existing rail and the new maglev. The Shinkansin is a magnificently successful line, but high-speed rail is very abusive of the right-of-way. They have 3,500 people work every night repairing it and it is getting worse because it is beginning to deteriorate. They plan to run the two lines in parallel in their different locations.

And Japan is a train society. The comments we make that we will make a third generation—they are up to the second generation—has to do in part with performance and economies resulting from the different needs here.

They are a train society. They will still send 20 cars with 2,000 people every three minutes from center point to center point. That will not work in America.

In summary, they understand high-speed rail as well, and it is the same company building the maglev.

Senator EXON. I will ask this of any member on the panel who would like to address it. What about any concerns about health, adverse health affects for the magnetic fields created by maglev?

Have there been any studies that you have seen? I know that there have been several reports recently of health effects on the electric and magnetic fields produced by the transmission lines.

Are you aware of any health-related concerns associated with current electro-maglev technology or is that something we still have to do some research on?

Dr. DANBY. I can address that if you wish.

Senator EXON. Thank you.

Dr. DANBY. The German train does not have much of a magnetic field problem. In the first embodiment of the Japanese, they had significant leakage fields. I think other than that it worked beautifully. They are now taking steps to correct that.

My colleague and I have schemes in which the magnetic fields are at the everyday ambient level. It is a red herring to say that this is a fundamental shortcoming of superconducting maglev.

As far as what is known of biological effects, it is probably exaggerated. But as a social fact in our present day society, magnetic fields are not at nearly ambient levels you are going to have terrible problems because people will worry.

There have been some studies that show at a very weak statistical level that children had double the rate of cancers who lived immediately adjacent to power lines.

Now, the people who did this are the first to tell you it is only a few cases and for all you know, if real it is from spraying to kill the vegetation, etc., but it was a surprise to the power companies when they had to do those studies. The first study was repeated with that same tiny but positive result, and so one has to take that seriously. But these magnetic fields are at levels, by the way, which are smaller than found in cities and in most households.

Just to summarize, our versions of maglev will not have magnetic fields bigger that we are used to dealing with everyday already.

Senator EXON. Interestingly enough, Dr. Danby, the description that you just used came to me in a letter within the last month from Colorado, from someone out there that was complaining about overhead power lines going in and was worried about the fact that his youngsters were going to play under the power lines and why should they get cancer?

Are you telling me then that a maglev railroad, the one that you would envision, would even be less than an overhead power line going across someone's property from a standpoint of health safety?

Dr. DANBY. I believe so, in substance. It is kind of complex because it is well known that if there are effects, AC fields, like 60 cycle, are much worse that DC. And so the magnetic field from the maglev basically will be a traveling wave effect and an effectively DC magnetic field. So that is a factor in it, but in addition, we would get down to Earth's field levels.

Now the power lines are themselves at or below Earth's field levels, but the fields are pulsing 60 times a second continually and, as I said, nobody even knows if it is a real effect.

It may also be the electric gradients because powerlines operate at very high voltages, whereas maglev does not. And so it is not really understood for transmission lines either the exact cause or the significance, but you cannot responsibly ignore medical consequences. It is not a basic problem as we see it for maglev if designed with this concern in mind.

Senator EXON. Mr. Boardman, let me ask you this question. In your opening statement you said that loan guaranteed programs were premature. However you then stated that the Federal Government could act as a financial catalyst.

Could you be more specific with regard to the role the Federal Government should play in encouraging the venture capital firms to invest in maglev?

Mr. BOARDMAN. We believe that your cooperative agreements are absolutely necessary to begin the process of developing a U.S. maglev technology and those would obviously be on a cost-sharing business with private industry.

We look at loan guarantees as something that would come into play at the commercialization stage, and we do not see that for another five, six, seven years, once the U.S. technology is developed.

Senator EXON. Thank you. Dr. Yurek, you suggest that the superconducting maglev system will likely result in lighter, lower cost guideways, be easier and cheaper to install and maintain, and the guideway propulsion system is simpler and cheaper to maintain than systems based on electromagnets.

What was the state of the superconducting technology during the development of the first generation maglev system, and how do you compare them, or can you?

Mr. YUREK. Well, the comment actually comes from—it was a quote actually from the MTAC report to the Senate last summer, so we were quoting from that report.

One of the basic features here is that in the electromagnet system, the German transrapid system, the clearance between the magnets and the guideway is only about three-eights of an inch, which seems like an awfully small distance compared to the superconducting maglev situation where the train is some four to six inches away from the guideway, and we at CSAC believe that in fact that is a much more reliable system to deal with.

So we believe that ultimately that is going to be the reliable system of the future.

If I also may comment on your question regarding magnetic fields. I agree with Dr. Danby's comments about the evidence being rather inconclusive concerning the effects of magnetic fields on the health of humans.

There are weak correlations as he pointed out, and it is a social factor, as he also pointed out. But here again, it is one of those potential spin-offs of pushing forward with maglev because superconductors in fact are perfect shields for magnetic fields, absolutely zero magnetic field goes through these materials.

One of the potential spin-offs is in fact using high temperature superconductors in sheet form that we are now developing at our company, for example, that can be put in the bed of these cars, the floor of these cars to give you that perfect shielding, and another spin-off in fact could be an underground buried power transmission lines which could be perfectly shielded, especially in high population areas.

So I think that is another thing we have to look at, coming out of a push forward in the technology of maglev, the spin-offs.

Senator EXON. Thank you.

My last question of this panel then will be of Mr. Pattison. Mr. Pattison, S. 2286 authorizes cooperative research between the Federal laboratories and the private sector pursuant to the Stevenson-Wydler Technology and Innovation Act.

You have also testified for the need to include additional provisions to encourage research outside the Federal laboratory environment, by granting those outside entities ownership rights in the technology?

Could you please elaborate on this?

Mr. PATTISON. Well, I agree with what the bill says. Using it outside, I think that that is a possibility, but I am not real sure how that is going to work, you know, who it is going to favor or whether it is going to be best for the systems.

[The following information was subsequently received for the record:]

REED SMITH SHAW & MCCLAY

MEMORANDUM

March 22, 1990.

To: Robert K. Pattison.
From: Donald M. Itzkoff and Thomas N. Bulleit.

Pursuant to your request, this memorandum amplifies the High Speed Rail Association's position on S. 2286, the Magnetic Levitation Transportation Act of 1990, in response to Chairman Exon's question regarding whether federal support of maglev research may more appropriately be undertaken in or outside of federal laboratories.

As explained more fully below, the Chairman's inquiry highlights the principal area in which we believe that S. 2286 could be enhanced. Pursuant to the Federal Technology Transfer Act of 1986, federal agencies may delegate to federally-owned or operated research laboratories within their jurisdiction the authority to enter into cooperative research and development agreements ("CRADAs") with non-federal entities. 15 U.S.C. § 3710a(a). In a typical CRADA, the non-federal party contributes funds and expertise toward a research plan that builds on technology that is available in a federal laboratory, in exchange for ownership or licensing rights in any patentable inventions that may result. Under a CRADA, the federal government may not contribute any funds. 15 U.S.C. § 3710a(d). The government's contributions are limited to personnel and other resources.

Because of the Technology Transfer Act's prohibition on federal funding of non-federal entities, the CRAD mechanism is appropriate only for cooperative research with a federal laboratory. Thus, as currently written, S. 2286 would seem to authorize the Secretary of Transportation ("Secretary"), at most, to fund research projects at federal laboratories.[1] A private entity could also contribute funds and participate as a research partner. However, in its current form, S. 2286 does not permit the Secretary to commit federal funds to promising research that may be underway in private industry or academia.

An alternative to the CRADA mechanism which does not require the participation of a federal laboratory is what the federal patent statute describes as a "funding agreement." 35 U.S.C. § 201(b). Under a "funding agreement," the non-federal recipient of federal funds automatically gets the right to ownership of any patentable inventions resulting from research conducted under the agreement. 35 U.S.C. § 202(a) (small businesses and nonprofit organizations); Executive Order Feb. 18, 1983 (large businesses).[2] In contrast, under a CRADA, the disposition of rights is left up to negotiation; the laboratory may agree to give up its ownership rights, or (and more frequently) to grant in advance licensing rights. 15 U.S.C. § 3710a(b).[3]

For these reasons, it is our position that S. 2286 should be amended to give the Secretary clear authority to commit federal funds and resources to maglev research both inside and outside federal laboratories. It is important to authorize both approaches, because the most valuable maglev technologies may ultimately be developed in a variety of settings.

If you have any questions or desire any further information, please do not hesitate to call Don Itzkoff (202/457-8695) or Tom Bulleit (202/457-8696).

Senator EXON. Thank you, Mr. Pattison, Dr. Yurek, Mr. Boardman and Dr. Danby, thank you so much for your patience and your excellent testimony, and you are excused.

Our final panel today, Panel No. 2, would please come forward at this time. Dr. Richard J. Gran and Mr. Ervon Koenig.

Dr. Gran is the Director of Advanced Concepts, Grumman Corporation, and Dr. Ervon Koenig is Marketing and Business Develop Manager of Transportation, the Bechtel Group.

Welcome to you, gentlemen, and thanks for being here. It has been a long afternoon and I appreciate your patience. We will start with you, Mr. Koenig.

---

[1] In addition, it should be pointed out that the Technology Transfer Act contemplates the exercise of CRADA authority at the laboratory level, rather than at the agency level. 15 U.S.C. § 3710a(a); *see also* S. Rep. No. 283, 99th Cong., 2d Sess. 4 (April 21, 1986). However, since the relevant federal laboratories will in all probability not be within the Department of Transportation, but rather the Department of Energy and other agencies, the Secretary ordinarily would have no authority to delegate to those laboratories the authority to enter into CRADAs. Thus, it does seem appropriate to give CRADA authority to the Secretary, recognizing that he may have to secure the cooperation of another agency to exercise this authority. Presumably, the Secretary's authority to commit DOT funds to a federal laboratory for such research would be a powerful incentive for the other agency to cooperate. If the legislation is intended to authorize the Secretary of Transportation to enter into CRADAs on behalf of federal laboratories within the jurisdiction of another agency, without obtaining the approval of that agency, this intent should be clarified.

[2] There are a few exceptions, such as for "exceptional circumstances." See 35 U.S.C. § 202(a).

[3] In addition, every CRADA must provide for payment of a percentage of any royalties received for licensing of a government-owned invention to the individual inventor. 15 U.S.C. § 3710b. While there is no requirement that the laboratory receive any royalties, the one purpose of the Federal Technology Transfer Act is to give incentives to inventors, and so most agencies will want to retain the right to royalties.

STATEMENT OF ERVON R. KOENIG, MARKETING AND BUSINESS DEVELOPMENT MANAGER, BECHTEL

Mr. KOENIG. Thank you, Mr. Chairman. I will deviate somewhat from our written testimony to try to make a few points here.

Senator EXON. The written testimony of both of you will be entered into the record.

Mr. KOENIG. Thank you.

I just returned from West Germany last week where I had the privilege of escorting a delegation of California and Nevada officials.

I want to amplify a little bit that Bechtel engineers and specialists have undergone a complete technology transfer process and analysis of the transrapid system. And as a result of that analysis, we are convinced that this technology is ready for application.

I might point out that Bechtel is teamed with Transrapid to implement this technology on a demonstration project in Orlando and also a pilot system between Las Vegas and Anaheim, California.

I believe that it is imperative that we take advantage of this technology for a number of strongly interrelated reasons. the environmental quality, energy efficiency, increased transportation capacity, reduced reliance on imported fossil fuels, high speed, extremely low maintenance costs and safety.

There has been a recent safety study done by an independent consultant, a group out of Switzerland, and we expect the results of this study to be released in one to two weeks, which states that the maglev system that has been developed in Germany is the safest transportation system for moving people at high speeds and that, of course, includes airlines and trains.

Mr. Chairman, we in the transportation systems and development community are encouraged by the recent actions with the executive and legislative bodies of the U.S. Government, including your very strong personal interest in this technology.

As you are aware, the fiscal year 1991 budget request for both the Corps of Engineers and the Federal Railroad Administration contain line items for research and development of magnetic levitation technology including safety standards.

Secretary Skinner's recently released National Transportation Policy Statement states in part, "While private investment will be the central feature in putting any of these new generations of transportation systems into place, the Federal Government can serve as a catalyst and ensure that regulatory and institutional barriers do not impede implementation of viable systems."

I want to make it very clear that Bechtel believes it is important that we establish a maglev demonstration project in the U.S. in the near term.

We are not opposed to a national research program, and in fact, we encourage that. We also recognize that we have needs that exist today and problems that can be solved with existing technology which is already in place, which not only can serve as a demonstration project but can serve as a pilot system which can possibly be expanded in the future.

We believe the Secretary's policy statement includes a very ambitious and cogent agenda which revolves around six key themes, including advancing U.S. transportation technology and expertise for the 21st century.

We believe this is best accomplished by fully supporting the development of innovative transportation systems such as the Orlando and Las Vegas-Anaheim projects. Regardless of the origin of the technology, nothing will create competition faster than actual construction and successful operation.

Bechtel believes ideal conditions exist within these two markets, and we are excited by the opportunity to be on the leading edge of a transportation revolution.

However, as participants in both the Orlando and Las Vegas-Anaheim projects, we recognize that developing, permitting and financing such ventures will require the support and confidence of the Federal Government.

It is our opinion that the technology that we are convinced is now ready to apply, the engineering and the construction are not the challenges to implementing such a system in the U.S. We see the challenge as being financial and institutional.

It is going to take a pretty good faith estimate on the financial community's part to take a ridership analysis and some projected real estate development figures to convince them that that is adequate for them to finance a project of these magnitudes.

We know this very well because we were instrumental in putting together and assisting the development of the financial plan for the English Channel project. We have been there and we know what it takes.

We also know that institutional barriers that might hinder the development of these programs have to be dealt with. By institutional barriers I mean anything that is going to stop or slow down that project during the construction progress.

We are talking about large dollars. Any delay in constructing or the bringing of that system on line according to the financial plan and schedule will have serious consequences in the profitability and viability of the project.

I think we all need to think and work hard on how we can come up with schemes to make these systems effective, so that we can move forward with no delays in construction.

We believe the Federal Government has a definite role to play in successfully integrating magnetic levitation technology into America's transportation infrastructure. By statute the Congress has given the FRA the prime responsibility for establishing system and technology safety standards.

We have had discussions with the FRA regarding the transrapid technology and look forward to working closely with the FRA towards full certification of the system.

I should note that the West German government is in the process of completing a comprehensive schedule of testing and certification for the Transrapid International Facility.

Mr. Chairman, the bill that you and Senator Hollings recently introduced, S. 2286, the Magnetic Levitation Transportation Act of 1990, is a positive step in further involving the Federal Government in the development of the commercial magnetic levitation transportation system in the United States.

Bechtel agrees with the bill's intent to attract American technical and business interests to this technology. Further, we support the establishment of a separate office within the FRA to foster and coordinate the regulatory framework for uniform, technically credible and safe system development.

This office will also in our opinion provide industry with an interest in magnetic levitation technology a single point of contact for technical and safety matters.

As intra/inter-city projects progress through myriad institutional procedures and jurisdictional demands, we foresee this office playing an active role in facilitating the interface between system developers and the Federal Government.

The other bill introduced by Senator Reid, S. 1898, The Mag-Lev Guarantee Pilot Program Act provides for Federal guarantees of investments by state and local government pension funds and high speed inter-city rail facilities. We applaud Senator Reid's efforts to provide magnetic levitation transportation projects with additional sources of financing.

The Reid bill encourages U.S. companies to enter the system technology arena for magnetic levitation transportation and other high-speed systems and prohibits the use of the guarantee for nondomestic technology.

Unfortunately at this time, however, there is no current U.S. magnetic levitation transportation technology sufficiently advanced and tested to be commercially accepted to investors or developers. It should be noted that magnetic levitation systems will include 80 percent to 90 percent domestic product in terms of system construction cost.

The major construction cost in these systems is not in the cars and the magnets, but in the guideways and other civil structures. The cars can be assembled in the U.S., providing further domestic benefits; only parts unique to the vehicle and system, representing less than 15 percent of total costs, would be produced elsewhere.

We believe it is important to establish this demonstration project in the U.S. as a stimulus to further development, and as such would favor a modification to Senator Reid's bill regarding the U.S.-only clause.

Super-speed ground transportation must move beyond the test track to a commercially viable demonstration of inter-city passenger service. Bechtel believes several such opportunities exist in the United States.

The most advanced planning for an inter-city system is being done for the previously mentioned Las Vegas-Anaheim Super-Speed Ground Transportation System. If everything goes according to schedule, including permitting and private financing (construction costs are estimated at $4 billion), we expect to commence operation of a 251-mile magnetic levitation system in 1998.

Another project also well into the planning and development stage is the 17-mile intra-city system proposed to connect the Orlando Airport with the city's International drive commercial sector.

Meanwhile, a consortium in Pittsburgh, PA, has announced a proposal to build a system connecting the Allegheny County Airport to downtown Pittsburgh, and ultimately to other parts of Pennsylvania.

Each of these, with the exception of the Pittsburgh project, are proposed as private ventures utilizing private capital for financing and ownership. That in itself is a noteworthy endorsement by the private sector of the commercial viability of this technology for intra/inter-city passenger transportation systems.

Thank you, Mr. Chairman. That concludes my opening remarks.

Senator Exon. Thank you very much, Mr. Koenig.

I am very pleased to recognize you now, Dr. Gran. Thanks for your patience and thanks for waiting.

STATEMENT OF RICHARD J. GRAN, DIRECTOR OF ADVANCED CONCEPTS, GRUMMAN CORP.

Dr. Gran. Thank you, Mr. Chairman. I want to summarize some of my remarks. We at Grumman believe that the technological and economic feasibility of maglev has been demonstrated. There are, however, some very major issues that we feel still have not been demonstrated to our satisfaction.

First of all, to make a system that is economically viable, we believe that you must have access to the Federal highway system, and we will go on record as saying that.

Second, we believe that Federal standards are absolutely necessary in order to guarantee that an integrated system in the United States will be possible in the future.

I think it is foolhardy to encourage each local government entity, to build its own system, because sooner or later we are going to want to connect them together. If we do not have a standard they will not connect.

Maglev is not like railroads where it is simple to go back and change the gauge slightly; change the tracks on the train, change the steel rails and put some new ties in and the system connects. Maglev will not work that way.

Senator Exon. Dr. Gran, let me just stop you, I was wondering about that. As I understand some of the differences between the Japanese system and the German system is that the space that separates the vehicle from the part that produces the field—is that right?

Dr. Gran. That is correct.

Senator Exon. And they are no way interchangeable, is that right?

Dr. Gran. They are fundamentally incompatible systems. They do not connect.

Senator Exon. So if you were going to have one of those systems, you would have to go with one or the other and if you produce your own system here in the United States, it is likely that that would not be compatible with either of those systems?

Dr. Gran. That is correct.

Senator Exon. Thank you.

Dr. Gran. The reason for the United States to investigate a system is because the track cost is what will make or break Maglev economically. Eighty percent of the system cost goes into the track and it might even be as high as 90 percent.

The train that you are going to design, works intimately with the track. You cannot design the train and track independently. So the technology that you choose determines what the track is like and how much it costs.

We have done an economic analysis, and we believe that the costs of a track must be on the order of $12 million per mile in order to get a return on investment that makes sense.

Everything that we have heard from both the Germans and Japanese, put their guideway costs above $20 million and probably closer to $40 million per mile. At those ranges, our analysis shows that you cannot run an economically viable system.

So the government's role in the early phase is fourfold. First, to encourage a design that would become the U.S. standard. This system should be the most cost effective design—the one whose guideway costs are as low as possible.

Second, we also expect that the government would set safety standards. Administrator Carmichael pointed that out and I think I agree with him wholeheartedly.

Third, it should be reliable. To get the most reliable approach, the system has to have an integrated control system that allows the trains to operate with close headings but reliably stops them from coming too close together. The safety issue is a very real problem.

The fourth government role is a prototype. I believe that the only way that financiers will believe that a system can be put together is if in fact a prototype is built. The prototype must demonstrate that all of the economic analyses, which are based on ridership, operating time and other factors are understood. Then, and only then, will financial backing become available.

To the extent that S. 1898 suggests a financing method, I believe that it is a very useful bill. For the prototype system, it would be a way to keep the interest rates in the 8 percent to 9 percent range, which is what we have assumed in the economic analysis that arrived at the $12 million per mile cost.

And incidentally, there is a curve in the written testimony that shows our economic analysis. We have assumed in that on the order of 2,000 two way passengers per hour use the system, that the system is 300 miles long, and that the construction costs would be on the order of $12 million.

For that case, the ticket price would come out to be under $100, roughly $95, including a 20 percent profit for the company that develops the system.

Our analysis assumed a five-year construction cost, but the cost of construction and any of the construction delays that were talked about in earlier testimony could dramatically affect the economics.

Another area that has to be considered in the overall design, is understanding what the potential operational problems might be and to design the system to mitigate them before they happen.

I would like to end with a comment. I happen to love the program "The Ascent of Man" that was done by the British philosopher, mathematician and scientist, Jacob Bronowski. He made the following comment. "The ascent of man will go on, but do not assume that it will be carried by western civilization as we know it. We are being weighed in the balance at the current moment. If we give up, the next step will be taken—but not by us. We have not been given any guarantee that Assyria, Egypt and Rome were not given. We are waiting to be somebody's past, and not necessarily that of our future."

Maglev is one of those steps that Dr. Bronowski was alluding to—we have an opportunity to make an impact on the future, to set the direction for cost-effective, nonpolluting, efficient and rapid transportation for the next century.

We cannot afford to lay road blocks in the way. We must start now. We must challenge the best and the brightest in America to reassert technological leadership. As the report of the Maglev Technology Advisory Committee stated, the question is not whether we can afford to build a maglev system, the issue is—can we afford not to?

Thank you, sir.

[The statement follows:]

Testimony on:

S. 1898, the Mag-Lev Guarantee Pilot Program Act
&
S. 2286, the Magnetic Levitation Transportation Act of 1990

by
Dr. Richard J. Gran

Director of Advanced Concepts
Grumman Corporation
Bethpage, New York 11714
March 21, 1990

Mr. Chairman and Members of the Subcommittee:

It is a pleasure for me to appear today before the Surface Transportation Committee of the Senate Committee on Commerce, Science and Transportation to comment on the two magnetically levitated transportation bills that you are considering. As you may be aware, Grumman has been involved in various aspects of transportation for many years. In the early 1970's we developed a tracked air cushion vehicle under contract to the Department of Transportation - a vehicle that tested one of the many competing concepts in ground transportation that were proposed at the time. This experience convinced us that the development of a cost effective, integrated, and environmentally safe transportation system was not only possible, but could be done with existing technology. The only requirement, in our minds, was a commitment to pursue this goal on the part of government at the federal, state and local levels. We stood by with a prototype vehicle waiting for further development to be encouraged by the government - a wait that proved to be in vain. The hiatus has been disappointing. The bills that we are discussing today could be the start of a new thrust that I, and the Grumman Corporation, welcome.

Once again we are at a crossroads. The technology that is required to build a Maglev system exists. There are only economic and political problems. This situation is reminiscent of the early years of the steam locomotive. In 1797 Richard Trevithick demonstrated three different models of a tracked steam locomotive. By 1804 - seven years later - he had a prototype vehicle. It was not until 1829, however, before a practical transportation system was in place. The intervening time was spent in developing the proper systems solution. A track concept and an infrastructure were developed. The solution allowed a practical railroad to be built over the next two years, so that by 1831 a system was in place.

The reasons for building a Maglev system parallel the reasons that motivated the design of the steam locomotive. This comparison with the steam locomotive is not strained. We know how to build a train that can be levitated with superconducting magnets or with conventional magnets. This has already been demonstrated by the Japanese and the Germans. However, if one looks at the cost of the tracks required by these existing systems - we find that we are closer to the state of the steam locomotive in 1804 than in 1829. One of the major problems is that the wrong Maglev vehicle design can easily lead to a very costly track design. Since the costs of the guideways for a typical system are such that the guideway costs are over five times greater than the cost of all the vehicles that move on it, the wrong track design could lead to a very expensive and uneconomical system.

Grumman published the report from the Maglev Technology Advisory Committee on the "Benefits of Magnetically Levitated High-Speed Transportation for the United States". This report concluded that the U.S. transportation system is encumbered with congestion and delays that waste many manyears of potentially productive time. Scarce energy resources and the pollution caused by inefficient usage of existing fuels have combined to set the stage for an alternative. The committee concluded that this alternative should be Maglev.

It is technically and economically feasible to build a Maglev system. However, the scale of the effort requires government involvement. First, to make a system that is economically viable, access to the Interstate Highway System for right-of-way is required. Second, federal standards are needed to insure that an integrated system will be developed. If each state is allowed to contract for a system that is designed and developed locally with no national uniformity, the ability to connect a national Maglev system would be greatly jeopardized. Thus the federal government must take the lead in developing the requirements for the system design. We see the federal funding for Maglev providing industry with the ability to:

- Specify a design that would become a U.S. standard
- Find the most cost effective system
- Specify safety standards
- Develop the most reliable approach.

When this is complete, the government should fund the first prototype.

The two bills we are discussing today are the first steps in this process. The first, S. 1898, will allow a prototype system to be built that will not be burdened with an excessive interest rate. We have done an economic analysis of Maglev, and we are convinced that the revenues from operation will pay back the construction costs in 15 years if a Maglev guideway system can be built for about $12 million per mile, and the interest rate for the construction can be kept in the 8 to 9% range. The proposed legislation is one way to do this.

As a further incentive, it should be possible for developers to use tax exempt revenue bonds. The state of Florida has proposed such a financing measure for their high-speed rail construction effort.

The economic analysis that I alluded to before provides some insight into the way that a Maglev system might be financed. There are three major drivers in the return on investment for an operational system:

- Number of Passengers per Hour
- Track Cost per Mile
- Financing Cost.

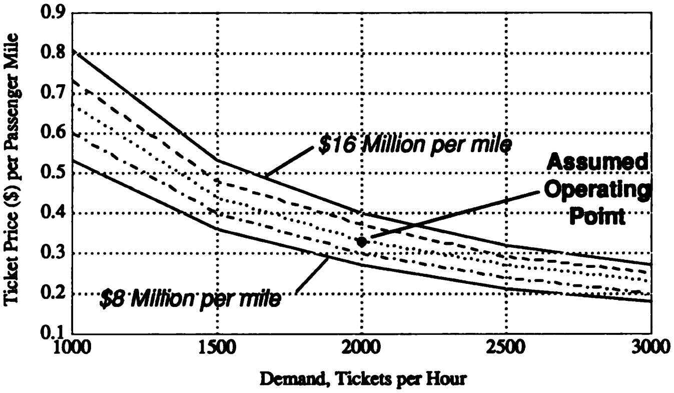
The most realistic assumptions provide a price per ticket of 33 cents per passenger mile for the $12 million per mile guideway cost when we assumed a ridership of 2000 passengers per hour. This would result in a one-way ticket price of under $100 for a 300 mile trip. The figure on the next page shows the assumptions that we used in this analysis and the resulting ticket price per passenger mile for different track costs and demands.

The major reason an American initiative in Maglev is required is that the costs for both the German and Japanese guideways are above $24 million per mile. These are beyond the range of costs that are illustrated in the figure and would result in one way ticket prices that are in excess of $200 for a 300 mile trip. A Maglev system that

Figure 1
Maglev Economic Analysis

Assumptions:

- **300 mile Guideway.**
- **$500 Million Supplied by Federal Government for R&D.**
- **Payback of 20% is based on 15 years of operation.**



- **Future Interest and Inflation Rates will follow "Data Resources Inc." (DRI) forecasts.**
- **Starting at the upper curve, the guideway costs are:**
  $16 million, $14 million, $12 million,
  $10 million & $8 million per mile.

would have to sustain these guideway costs would make it uneconomical. This puts my comments at the start of this presentation and the analogy with the steam locomotive into perspective. Development is needed to lower track cost and arrive at a more economical system design - to bring us from the 1804 state to the 1829 state.

The second bill, S. 2286, will provide the required funds for the systematic exploration of the most cost effective and safest design. We encourage the use of this money to fund industry to do the requisite Maglev R&D. This funding should be competitive. A series of awards should be given to teams with alternative promising approaches. These should be developed to enough detail so that an objective comparison among all of the approaches can be made.

In the last episode of his TV Essay - *The Ascent of Man* - the renowned British mathematician and educator, Jacob Bronowski, asked whether or not the "ascent" that he had painfully described over a period of thirteen episodes would remain in the mainstream of western civilization. He said, "The ascent of man will go on. But do not assume that it will be carried by western civilization as we know it. We are being weighed in the balance at this moment. If we give up, the next step will be taken - but not by us. We have not been given any guarantee that Assyria, Egypt and Rome were not given. We are waiting to be somebody's past too, and not necessarily that of our future".

Maglev is one of those tests that Dr. Bronowski was alluding to. We have an opportunity to make an impact on the future - to set the direction for cost effective, non-polluting, efficient, and rapid transportation for the next century. We can not afford to lay road blocks in the way. We must start now - we must challenge the best and the brightest in America to reassert technological leadership. As the report of the Maglev Technology Advisory Committee stated, "the question is not whether we can afford to build a Maglev system; the issue is - can we afford not to?"

Senator EXON. Thank you very much.

Let me ask you this question, first, Mr. Koenig. You suggest that there is no U.S. maglev technology sufficiently advanced and tested to be commercially acceptable to investors or developers. What, if any, modifications to S. 1898 do you believe are necessary, and would take into account your view of the current state of the U.S. technology in this area?

Mr. KOENIG. I would suggest a possible modification to that bill might allow a certain percentage of a system in order to implement these pilot programs to be imported or produced from other sources.

And based on our analysis right now, it is certainly less than 15 percent of the total system cost that would be involved.

We also are certain that there is no technology in the U.S. that is ready for application right now for maglev intercity connectors, and we do not anticipate that there is going to be any probably for 10 years.

Senator EXON. Dr. Gran, let me ask you about S. 1898. Do you believe U.S. companies will make future investments in maglev development without the type of loan guarantee program in Senator Reid's bill?

Mr. GRAN. I do not. And I think, even more than that, you need the two bills together. The first, obviously, to make it economically viable to have the kind of money available at the interest rates that you need in order to design and build this system.

And secondly, you need a demonstration project, in some form, to convince financiers, of the economic viability. I think if I were a pension administrator, I would be reluctant to invest in a maglev at the current time no matter whose it was. Because, the economics do not make sense in many of the systems that are being proposed.

So, therefore, you have the problem: How do you get started? I believe that it is important to have both bills for that reason.

Senator EXON. I will ask this of either of the panel members. If you know the answer to it, we would appreciate your both stating it.

In your testimony you indicate that the access to interstate systems for right-of-way is required to make the maglev system economically viable and for national uniformity and design. Are you aware of any effort or accomplishments underway currently between the states to address the need for some uniformity between the various systems, and the ability to connect maglev systems in the future? And what possible jeopardy might be in that area?

Likewise, I suppose the same could apply to right-of-ways on railroads.

Dr. GRAN. I am not aware of anything. And in fact every time I have attempted to bring this to the attention of the people who are currently proposing systems, it is usually shrugged off. It is in fact just the opposite.

Mr. KOENIG. Well, we in fact have done some research on the accessibility of the right-of-way, and we have had some direction or guidance from the Federal Highway Administration, to the effect that they do not believe that any federal legislation would be required to make the rights-of-way available if both the States of California and Nevada, for example, want to do so.

We also have looked at future generation potentials for maglev, and since the systems that we are looking at would tend to be supported on some sort of column structures, it is very possible that the foundations and columns could be made in such a fashion to be adaptable to a different type guideway structure at a later date. So that you would not have to replace the whole system.

And certainly, further studies on the compatibility of guideway types might be in order.

Senator EXON. Mr. Koenig, from your point of view and the experience you have had in this area, would you say that the organization that you are with, that has done a lot of development, would you say that there is considerable excitement about the possibility for maglev and, if so, has your organization indicated that they would be willing to put up money for capital construction?

Mr. KOENIG. Well, I will take the first part of that question first. There is a lot of interest and excitement within our organization to proceed forward with the maglev technologies. We base our whole approach to the markets in serving public needs based on new technologies, and this is a true 21st century technology which is now available for application.

We are engineers and constructors, and we are not financial investors. So, as far as particular equity involvement in large pieces, probably not, but we would certainly be probably taking some equity interest. But we plan on using third-party funds.

Senator EXON. Dr. Gran, could I have your answer?

Dr. GRAN. I actually really do not have very much to comment about that. But I did happen to do a quick calculation from the earlier testimony from the senior Senator from Nevada. He pointed out that $40,000 was invested in 1840 in the telegraph. I calculated what that would be in today's dollars, assuming a 6 percent annual interest or inflation rate. It would be $320 million.

So if, in fact, we are talking about a similar kind of investment, which I think we are, it should have the same kind of rewards. And I think that is where we want to make the emphasis.

Senator EXON. That $320 million should come from private sources, government sources or both?

Dr. GRAN. Well, that $40,000 was a grant at the time to start up—or jump start, which are the words that have been used—an industry. And I think that is what we are talking about, jump starting an industry. Because then the rewards and the benefits are effectively in our balance of payments.

We in the U.S. are going to be building the roadbed, which is a dominant cost, but remember where the biggest positive trade balance comes from in the United States today, it is transportation and in particular the Boeing Company, I wish I could say it was Grumman. But they are in fact selling airplanes throughout the world. We would like to make sure that the transportation part of the balanced budget stays in the black. And this is a way to do it.

Senator EXON. Mr. Koenig and Dr. Gran, thank you very much for your excellent testimony. You have been very patient for almost three hours now. Your testimony was particularly helpful, and we thank you.

Dr. GRAN. Thank you, sir.

Mr. KOENIG. Thank you, sir.

Senator EXON. We are adjourned.

[Whereupon, at 4.52 p.m., the hearing was adjourned.]

ADDITIONAL ARTICLES, LETTERS, AND STATEMENTS

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
WASHINGTON, D.C. 20310-0103

3 APR 1990

Honorable J. James Exon
Chairman
Subcommittee on Surface
Transportation
Committee on Commerce, Science
and Transportation
United States Senate
Washington, D. C. 20510

Dear Mr. Chairman:

I appreciate the opportunity to submit our comments as part of the record of your March 21, 1990, hearing on magnetically levitated (MAGLEV) transportation systems. I commend your efforts to make MAGLEV a reality in this country. MAGLEV technology has the potential not only to revolutionize high speed transportation, but also to energize U.S. industry to regain its leadership in this rapidly emerging technology. We believe there is a compelling Federal interest in creating the right conditions for U.S. industry to be competitive in this arena and to maximize the possibility for their success.

As you know, the Fiscal Year (FY) 1991 budget request includes $3.5 million for the Army Corps of Engineers to conduct MAGLEV-related activities. We are excited by this opportunity and look forward to applying our extensive management and engineering capabilities to the Federal MAGLEV initiative. The Corps brings a long track record of successfully managing large and complex engineering projects that range from conventional civil works to high-tech facilities for the Department of Defense, the National Aeronautics and Space Administration and other agencies. Additionally, the Corps has a strong research and development (R&D) capability, with four separate research labs and a large R&D staff. Through our Construction Productivity Advancement Research (CPAR) program, we have created a very successful partnership with private industry for cost-shared R&D. Given this record, we think it appropriate that our organization serve as the focal point for the Government-industry MAGLEV technology development effort.

Specific areas where the Corps expertise can be effectively applied include guideway design and system integration. The guideway represents a major portion of the total capital cost for a MAGLEV system. A relatively small reduction in the unit cost of the guideway can yield significant savings in the overall system cost. Despite the high-tech nature of MAGLEV vehicles, guideway design is predominantly conventional civil and structural engineering. This fits precisely with the Corps expertise. An efficient and sound guideway design becomes all the more critical if Federal policy establishes a standardized guideway, which is essential if MAGLEV is to become a nationwide network. Expanding upon our considerable project management capability, we would be able to provide the necessary Federal oversight to integrate the guideway with the vehicle, thereby ensuring a total integrated system.

In response to the challenge MAGLEV presents, we are pooling our talents and resources with other Federal agencies for the MAGLEV program. We have formed an effective partnership with the Federal Railroad Administration (FRA), the Department of Energy (DOE), and various other Federal agencies involved in MAGLEV. Even more key to the success of the program than teaming at the Federal level is development of an effective partnership between the public and private sectors. We view the appropriate Federal role as that of a catalyst, bringing together the right industry players and focusing their efforts toward a common goal. It is U.S. industry that will ultimately have to build and operate MAGLEV systems in the United States, and it is crucial to have industry involvement from the start of the program. Toward that end, the Corps, the FRA and DOE will jointly sponsor an industry forum here in Washington, D.C., on May 2-3, 1990.

In conjunction with the preliminary feasibility assessment of MAGLEV that the FRA intends to issue this summer, the Corps and FRA will issue a draft implementation plan for developing a second-generation U.S. system. This report will provide a comprehensive work plan identifying the tasks, resources, and appropriate public and private sector roles in future MAGLEV development, with the ultimate goal being to develop an advanced U.S. MAGLEV system ready for commercial implementation by the year 2000. Contingent on the availability of future funding and authority for the Corps, it is our intent to have industry develop concept designs in FY 1991, and to require industry cost sharing for that effort. These will be coupled with a variety of technology, market and safety assessments by the FRA and health and environmental analyses by the Environmental Protection Agency and various other agencies.

Fiscal Year 1992 represents a major decision point for the Federal Government, when the agencies will provide objective information on the technical and market potential for an advanced U.S. MAGLEV system, on the ability of the private sector to continue with development of such a system, and on the appropriate roles of the Federal Government and private industry during the next phase of

MAGLEV development. At this time, we will identify the potential domestic and export markets for MAGLEV, assess the economic feasibility of such systems and suggest possible sources for private sector financing. An integral part of this effort will be a final implementation plan that will provide a detailed work plan for development of second-generation MAGLEV technology.

We recognize that there are many questions still to be answered on MAGLEV concerning the readiness of the technology, the market for MAGLEV in the U.S., and the willingness of the private sector to finance these projects. With the FRA, DOE and the other agencies, we are structuring a process to answer these questions by FY 1992. However, it is crucial that we do more than just assess the situation over the next two years. We must begin now to take positive steps in the development process if we are to have any chance to leapfrog the foreign competition. Successful development of an advanced U.S. MAGLEV technology is a win-win proposition for the United States. This technology could meet many of our transportation infrastructure needs in the next century. Further, MAGLEV could revitalize our industry, regain our competitiveness in the international marketplace and maintain our technological leadership.

The Corps has a tradition of providing engineering and management services to the Nation and of accomplishing new and challenging missions. I am confident the Corps can execute the technology development for MAGLEV. Major General Patrick Kelly, the Director of Civil Works for the Army Corps of Engineers, has the primary responsibility for the Corps MAGLEV activities. We would be happy to meet with you to answer any questions and brief you in more detail on the Corps involvement in MAGLEV.

Sincerely,

G. Edward Dickey

for Robert W. Page
Assistant Secretary of the Army
(Civil Works)

WRITTEN TESTIMONY
of
Robert P. Casey, Governor
Commonwealth of Pennsylvania

Re:
Hollings Hearings on S.B. 2286
(Hollings-Exon Bill on Federal Maglev Development Aid)

Submitted
Wednesday, March 21, 1990

First, I want to thank Senator Hollings for allowing me to submit this testimony in writing for the committee record on this important and far-reaching proposal, the proposed Maglev Transportation Act.

Pennsylvania, the state which I serve as Governor, has been a pioneer at every stage of transportation development in this nation -- from the Conestoga wagon to the space age. Some of Pennsylvania's transportation firsts include the first commercial steamboat and the nation's first all-weather superhighway (the Pennsylvania Turnpike). George Washington made railroading safe and fast and the state was a center for locomotive manufacture. Air mail was pioneered in Pennsylvania. I could go on and on -- but it's a list focused on the past.

We are here today to talk about the future and about magnetic levitation transportation.

It is a transportation future in which Pennsylvania hopes -- again -- to play an important role. And, for that reason, I submit this testimony in support of the Hollings-Exon bill.

Magnetic levitation was first developed as a concept in the United States in 1912. The Federal Railroad Administration and the Urban Mass Transportation Administration fostered later development efforts in the 1960s and 1970s. But, like the video cassette recorder, it was a concept left to other nations to refine and polish. Thus, the most promising systems for magnetic levitation transportation are under development today in Japan and West Germany -- and it is the German system which appears to be most commercially feasible at this time.

The early development efforts in the United States, though, have not been totally superseded by foreign development. The technology and the patents developed with FRA and UMTA aid were acquired by Carnegie Mellon University in Pittsburgh with the help of the Commonwealth of Pennsylvania.

We in Pennsylvania see magnetic levitation not merely as a transportation technology but an industrial technology. It fits well into our state's master plan to develop our high-tech capabilities as part of our economic development mix.

Toward that end, my budget for the Commonwealth of Pennsylvania for 1990-91 includes a $300,000 grant to foster a unique partnership between our public and private sectors and our institutions of higher education. In fact, our maglev initiative is but the latest incarnation of my administration's efforts to meld public and private resources with the brainpower of higher education to rejuvenate the state's economy.

I began this in 1987 through the creation of a state Economic Development Partnership which brought executives from business, labor, government and education to the same table.

Now, with maglev we have brought together business, labor, universities and city, county and state government to seek to develop a new technology to be centered in Southwestern Pennsylvania.

This may seem presumptuous to your committee, which may find itself hearing similar presentations of interest from other areas of the nation. Certainly, competition for federal aid to develop maglev technology should be keen because it will involve the creation of many thousands of centralized jobs in engineering, design and manufacture as well as operating personnel for the areas that maglev lines are constructed to serve.

But I do want to put the committee on notice, today, that we are moving ahead in Pennsylvania to earn the support that the Hollings-Exon bill should provide for basic design and development.

Here are some of the reasons:

First, we already have -- through the investment of state and federal dollars -- a center for the study of magnetic levitation at Carnegie Mellon University. The university, as I mentioned already, owns key patents.

Second, we have in Southwestern Pennsylvania a unique concentration of existing technologies to apply to magnetic levitation, including the nation's most renowned rail technology companies such as Westinghouse Airbrake.

Third, we have one of the nation's four federally-funded super-computing centers based at the University of Pittsburgh and Carnegie Mellon University and our state's PREPNet high speed communications' network has the capability to link all of our state's major research universities into one synergistic "think tank."

Fourth, we have created the corporate structure to develop this new technology, a for-profit corporation called Maglev, Inc.

This corporation, in itself, is a modern marvel. Its investors include business AND labor as well as government and institutions of higher learning like Carnegie Mellon University.

One of their first projects will be to determine the feasibility of constructing a 19-mile, high-speed maglev link between the new Midfield Terminal at the Greater Pittsburgh International Airport and downtown Pittsburgh.

The line can be more than a demonstration project, it can solve critical ground transportation problems created by Pittsburgh's location amid the steep ridges of the Allegheny, Monongehela and Ohio River valleys.

But the line should serve as an ideal demonstration project for the rest of the nation -- a demonstration project which can be built faster than those envisioned in other states because of the likelihood of use of existing rights of way. And, if maglev is half as good as its promoters say it is, it can serve as the first spoke in the construction of a multi-state transportation hub which can help clear our crowded airways of short-hop travelers.

This is a bold initiative in the long run. In the short run, though, we feel optimistic in Pennsylvania that the technology now in refinement can work effectively and efficiently to solve an existing transportation problem. We have constructed a unique partnership between government, business, labor and research institutions. What is needed now is federal support.

The Hollings-Exon bill promises that kind of support. And, for that reason, I commend its sponsors and urge its passage.

CSX
TRANSPORTATION

RAIL TRANSPORT GROUP

John L. Sweeney
Senior Vice President-Corporate Services

500 Water Street
Jacksonville, FL 32202
(904) 359-7662

March 20, 1990

The Honorable James Exon, Chairman
Subcommittee on Surface Transportation
Committee on Commerce, Science & Transportation
United States Senate
Senate Office Building
Washington, DC

Dear Mr. Chairman:

CSX Transportation is one of the nation's largest railroads. We continue to be, in many ways, involved in the movement of people as well as freight. Our track system provides major routes for Amtrak and we are also a provider of both track and operation support for several commuter agencies.

We, therefore, are interested in any public activity that touches on the movement of people, including high speed rail. That interest extends to the development of Maglev technology.

We are usually thought of as the provider of rights-of-way that follow the routes designed by public bodies. Sometimes plans are made for new transportation project initiatives without any consultation with us. For that reason, we joined and support Maglev, USA so we can be in at the beginning of whatever is decided in this area.

On the other hand, we do recognize the transportation problems faced by the nation that have resulted in enormous congestion in the airports and skies above, as well as our major highways. We are anxious to be as helpful as possible in finding long range solutions. We do not envision ourselves as being direct beneficiaries of any public financing of Maglev operations. We believe those will be largely conducted by public entities who will contract with manufacturers to develop technologies. Our rights-of-way will be used, or not used, at fair market value. We also believe such use of our right-of-way must take into consideration the freight movement needs, as well as the benefits that flow from the movement of people.

Sincerely,

John L. Sweeney

CSX Distribution Services, CSX Equipment, CSX Rail Transport and American Commercial Lines are units of CSX Transportation, Inc. and its affiliates.

NATIONAL ASSOCIATION OF RAILROAD PASSENGERS

236 Massachusetts Ave., NE, Suite 603, Washington, DC 20002
(202) 546-1550

BOARD OF DIRECTORS
Robert P Abraham PA
Paul Arden IN
George Armeit NY
Howard J Batcher IL
Andrea S Banks MA
Stanley Barriger NH
Gregory Bender NJ
Ken L Bird IL
Carl B Blaubach CA
Ronald P Boardman Jr IL
Douglas J Bowen NJ
Kenneth A Briers DC
Todd O Burger MA
James R Churchill VA
John A Dawson PA
John DeLora MI
Charles A Dunn FL
Henry Ferne II ME
Carl Fowler VT
William K Gilligan VA
William C Glasser OH
Barry E Green MT
Kevin J Gregoire MA
N Terry Hall GA
James Hamre WA
J Howard Harding OH
Paul R Hart PA
William Hoffman NV
Lewis M Hoppe NY
Griff Hubbard TX
R Don Hurst IN
Jim Hurtle MO
Catherine Johnson IA
Lawrence T Joyce PA
John H Kirkwood CA
Richard Kulla NY
Leif Lange CA
James H Larson ND
Stephen Linde NY
Ray F Long SC
Pierre Loomis IL
Daniel B Lovegren CA
George McCallum WI
John A Mills KS
Charles Montooth AZ
Hans S Mueller WA
John D Parkyn WI
Keith Perry KY
Bill Pollard AR
David S Renne VA
J Ben Ricketts VA
Patricia V Robbins WI
John A Ross NY
Stephen J Salatti NY
Carl Schiermeyer CA
Rolf R Schmitt MD
Theodore W Scull NY
Sharon Shneyer PA
Douglas P Sibley CA
Samuel E Stokes Jr NH
James M S Ullman CT
Stephen von Bonin DE
Ed Von Nordeck CA
W Mike Weber OH
Bruce D Williams IA
Ned S Williams TN
Alan L Wimmergren CA
Alan M Yorker GA

AT LARGE
Frank Barry NY
Ross M Goddard Jr GA
John Heffner VA
David O Jones CT
Anthony D Perl ON
Roy G Poulsen RI

President Emeritus
Orren Beaty Jr VA

President
John R Martin GA

Vice President
Eugene K Skoropowski PA

Secretary
Robert W Glover CA

Treasurer
Joseph F Horning Jr DC

Executive Director
Ross Capon

Assistant Director
Barry Williams

Membership Director
Jane Colgrove

Transportation Associate
Harriet Parcells

(Revised) March 27, 1990

The Honorable Ernest F. Hollings, Chairman
Commitee on Commerce, Science, and Transportation
Attention: Robert Holleyman
U. S. Senate
Washington, DC 20510

Dear Mr. Chairman:

In connection with your March 21 maglev hearing, we believe that high speed rail, broadly defined, should be eligible for any funding made available for high-speed intercity passenger ground transportation. Existing rail technology could make significant contributions to our transportation system almost immediately. Moreover, lack of investment in such systems is one of the biggest shortcomings in our transportation network.

We understand the 150 mph minimum in S. 1898 refers to average speed, so qualifying systems would need top speeds much faster than 150. We hope you will consider broadening S. 1898's definition of high speed rail to include any fast trains that divert significant air travel demand. Such diversion is probably the most oft-mentioned reason for interest in high-speed ground travel.

In the New York-Washington market, with Metroliners averaging 77-84 mph (top speed 125 mph) and other trains averaging 70 mph or less (top speed 110 mph), Amtrak carries almost 40% of air-plus-rail travel (70% with intermediate points).

We recognize that maglev may become significant in the next century but are appalled at how the federal government continues to discourage development of high speed rail. Our members are incensed at the priorities reflected in the administration's proposal to continue to do nothing for Amtrak and high speed rail while spending 73% more on aviation the next 5 years compared with the last 5 years.

Thank you for considering our views.

Sincerely,

Ross Capon
Ross Capon
Executive Director

cc: Senators Danforth, Exon, Kasten, and Reid

National Railroad Passenger Corporation, 60 Massachusetts Avenue, N.E., Washington, D.C. 20002 Telephone (202) 383-3000

Amtrak

April 2, 1990

Honorable Ernest F. Hollings
Chairman
Committee on Commerce, Science
and Transportation
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman:

I wanted to take this opportunity to commend you and the Committee for its leadership in the area of developing the national potential of high-speed rail and magnetic levitation systems. I believe quite strongly that there is a future for high-speed rail systems along several transportation corridors in this country and that federal leadership will be essential to develop and encourage this potential.

As you know, Amtrak is eager and capable of playing an important role in the high-speed rail area, both with respect to conventional high-speed rail systems and those based on magnetic levitation. Amtrak operates the only high-speed trains in this hemisphere, and we hope to operate any new high-speed systems that come on line. We have the most skilled railroad mechanical and operating employees in the industry, with special experience in the unique and demanding needs of passenger equipment. In addition, Amtrak has developed what generally is considered the world's most sophisticated reservations and train information system. With this experience, Amtrak not only can operate any new high-speed systems, we also can provide design work, mechanical and maintenance services, ticketing and reservations.

Amtrak is working closely with several state and regional high-speed rail authorities, as well as various companies actively pursuing high-speed rail in this country. For example, Amtrak hopes to obtain a contract to be the chosen operator and equipment and perhaps right-of-way maintainer for the Florida High Speed Rail Corporation, which is the only company being considered for the franchise to run the Florida High Speed Rail system. We also have met with companies hoping to develop magnetic levitation systems between Los Angeles and Las Vegas and between Disney World and the Orlando Airport in Florida; we are similarly interested in the magnetic levitation system being considered between downtown Pittsburgh and the Pittsburgh Airport. We have much to offer state and local authorities attempting to address their growing transportation needs, and we are optimistic that this will become an important part of Amtrak's future.

Amtrak strongly supports S. 2286, the Magnetic Levitation Transportation Act of 1990, sponsored by you and Senator Exon. The bill should encourage important and needed research that is critical to bringing magnetic levitation to the marketplace. I have one primary concern with the thrust of the bill, however, which I would like to bring to your attention.

While I am encouraged by your interest and support for this new technology, I feel it is extremely important that we not forget alternative technologies that can offer similar results at a smaller cost. In addition to conventional high-speed rail systems, such as the 200 m.p.h. French TVG, we have studied and inspected in Sweden new "tilt-train" equipment that would enable us to operate up to 150 m.p.h. over existing railroad rights-of-way, thereby meshing easily with existing transportation facilities in many cities, and enabing us to provide service approaching 2 hours between New York and Washington, and under 3 hours between New York and Boston, for example. Although these high-speed rail technologies already are proven, their implementation in the United States nonetheless will require important research and development that should be supported as strongly as research into magnetic levitation.

I would urge that S. 2286 be modified to encourage critically needed research into conventional high-speed rail systems, as well as research into magnetic levitation technology. Given Amtrak's experience and role in intercity rail passenger transportation, I also would urge that we be permitted to enter into agreements with the Department of Transportation under section 4 of the bill to conduct and transfer research in the high-speed transportation area without the 50 percent cost limitation that is applicable to other corporations. I believe that these changes would provide a more balanced and effective approach to implementing high-speed surface transportation in this country, as well as enable Amtrak to contribute to this effort.

I also would like to make one comment on S. 1898, the Mag-Lev Guarantee Pilot Program Act, introduced by Senators Reid and Moynihan. Under the proposal the federal government could guarantee loans made by state and local government pension funds to high-speed intercity rail facilities "High-Speed Intercity Rail Facility" is defined to include systems reasonably expected to operate at speeds in excess of 150 m.p.h. between scheduled stops. I firmly believe the 150 m.p.h. standard is arbitrarily and needlessly high. For example, between New York and Boston, the difference in travel time between a 150 m.p.h. operation and a 125 m.p.h. operation is minimal, because the number of curves on the route, even with tilt-trains, greatly limit the amount of time when the train can operate at top speed. By the bill's definition, loans to pay for the improvements necessary to reduce travel time between the two cities could not be guaranteed despite the obvious benefit of high-speed rail along that corridor. I believe that a speed of 125 m.p.h. is a far more practical and realistic definition for high-speed rail and would not in any way undermine the thrust of the bill.

I would be very pleased to discuss any of these issues more fully with you. Again, I applaud the Committee's leadership and efforts in this area, and we look forward to working with you.

Sincerely,

Graham Claytor

W. Graham Claytor, Jr.
President

DEPOSIT
JUL 3 1990
SHIPPED

Y 4.C 73/7:S.HRG.101-665 C.1
Magnetic Levitation Tr
Stanford University Libraries
3 6105 045 209 942

DATE DUE

STANFORD UNIVERSITY LIBRARIES
STANFORD, CALIFORNIA 94305-6004